WILDLIFE PORTFOLIO

OF THE WESTERN NATIONAL PARKS

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WILDLIFE PORTFOLIO

of the Western National Parks

BY JOSEPH S. DIXON, FIELD BIOLOGIST, SECTION ON NATIONAL PARK WILDLIFE, FISH AND WILDLIFE SERVICE

Photographs by the author unless otherwise credited

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Newton B. Drury, Director

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Foreword

WILDLIFE—its study, conservation, and management—has become important in public consciousness of the outdoors. Making pictures of wildlife is a popular hobby. Many visitors to our national parks go to these places with photography as an objective. Here all animal life is protected, and the rifle, shotgun, and trap are unknown. Picture makers, on the contrary, whether young or old, expert or novice, armed with the simplest or most elaborate equipment, are welcomed to "hunt."

As a standard for camera enthusiasts and for the enjoyment of others who simply like to look, the National Park Service is pleased to present this portfolio of pictures. Most of them have been made by that pioneer in the field of wildlife study, Joseph S. Dixon, who has also contributed the text of interesting life-history facts and anecdotes of his experiences with wild animals. We believe that park visitors will profit from this work of Mr. Dixon and the others who have kindly allowed use of their prize photographs.

This book, as well as the financial assistance that made many of the photographs possible, is due to the inspiration and generosity of the late George M. Wright, founder and first Chief of the Wildlife Division of the National Park Service (now the Section on National Park Wildlife, Fish and Wildlife Service).

NEWTON B. DRURY,
Director, National Park Service.

Introduction

THE PRIMARY PURPOSE of our national parks is to preserve these supreme examples of Nature's handiwork in as nearly a natural condition as possible for the benefit of both present and future generations. The secondary function of the national parks is to furnish inspiration, education, and enjoyment to all people. It has been a repeated experience in the educational and protective work of the National Park Service that the more people learn about the many different kinds of trees, birds, mammals, and flowers, the more fully they understand and enjoy them. In a similar manner it has been found, almost without exception, that the people who recognize, understand, and in turn appreciate these outstanding natural features of the national parks rarely if ever destroy or damage them.

On the other hand, it has been continually noted that much damage to wildlife and frequent serious injury to human beings has resulted from lack of information on the part of park visitors. No one insists that persons visiting a national park must have technical knowledge before they can appreciate the majestic beauty of a Sequoia or enjoy the fragrance and color of a flower. The boy who ignorantly played with a snake which he reported "barked at him with its tail," the girl who fabricated and wore a "beautiful wreath of (poison oak) leaves," and the woman who spent several weeks in the hospital because she ignorantly fed "a nice big black bear" candy from her hand are all closely akin to the fellow who "didn't know the gun was loaded."

In contrast to this, a great deal of legendary and unjustified fear prevents many persons from camping or otherwise fully enjoying their stay in nature's wonderland. Each year, I spend many hours explaining to questioning visitors in our national parks that there is actually a thousand times more chance of injury in city or highway traffic than of attack or injury by a wild animal in any of our national parks. It is my firm conviction after years of experience with many park visitors

that the peace of mind, more complete relaxation, and greater enjoyment resulting from a full knowledge and appreciation of the facts about wildlife demand our best efforts in popularizing the native species in the national parks.

ACKNOWLEDGMENTS

My thanks are extended to the late Dr. Joseph Grinnell, former Director of the Museum of Vertebrate Zoology, and to the University of California for permission to use several photographs taken by me for that institution, as indicated in the text.

I am indebted to the late Dr. Frank R. Oastler for the excellent photographs of the mother mountain goat and kid, and of the trumpeter swan standing on its nest. Several other photographs have been contributed by various persons and are so designated. For this assistance I am grateful to the following: Wendell Chapman, Frank Childs, Adolph and Olaus Murie, and Merlin Potts.

To the many rangers, naturalists, superintendents, and other members of the National Park Service who have assisted in this work I express my gratitude and appreciation.

SCOPE

During the past 35 years the author's field investigations have covered much of the Pacific Coast of North America between Point Barrow and Lower California. Studies have been made of the animal life in practically all of our western national parks. The photographs and data in this publication are based largely upon this lengthy field experience.

It has been impossible to photograph or even to mention briefly all of the several hundred species of birds and mammals found in all of the western national parks and monuments, so I have endeavored to select and to present a few representatives of the outstanding or characteristic species found in some of these areas. The list of both park areas and animals is necessarily incomplete.

I have been asked repeatedly by park visitors what kinds of animals would most likely be found in a given national park. For their convenience, the various species of animals are listed according to the scientific classification, using common names, followed by a list of the principal western parks and monuments in which the creatures may be found. (See page viii.) As here used, the term "species" includes all its subspecies. Thus, all geographic races of the black bear are grouped under the one heading: *Black Bear*.

METHODS

All of the photographs herein presented have, with a few exceptions as noted, been taken within a national park or national monument. No "movie trained" animals or other high-pressure methods have been used to procure spectacular results. It has been our constant endeavor to make the presentation as natural as possible. All of these photographs are of living wild animals in their native habitats. Photographs of bears, deer, and other supposedly wild animals eating out of a person's hand have been rigidly excluded from this publication because such feeding practices tend to pauperize the animals and to destroy their essential native characteristics and charm, thus defeating the primary purpose of our national parks.

List of Animals and Park Areas

In this list the mammals appear first, followed by birds and reptiles. Within each of the three groups the species are arranged according to the scientific classification, using common names only. Each name is followed by the name of the principal western national parks and national monuments where that species may be most readily observed. Areas in which these animals are more commonly found are listed first.

Mammals

Species	*Areas*
Black Bear	Yosemite, Yellowstone, Sequoia, Glacier, Crater Lake, and Grand Teton National Parks.
Grizzly Bear	Yellowstone, Glacier, Grand Teton, and Mount McKinley National Parks.
Pine Marten	Glacier, Yellowstone, Yosemite, and Mount McKinley National Parks.
American Badger	Yellowstone, Crater Lake, Sequoia, Yosemite, and Rocky Mountain National Parks.
Alaska Red Fox	Mount McKinley National Park.
Gray Fox	Yosemite, Grand Canyon, and Sequoia National Parks.
Coyote	Yellowstone, Rocky Mountain, Yosemite, Sequoia, and Grand Canyon National Parks.
Mountain Lion	Yosemite, Sequoia, Glacier, and Zion National Parks.
Golden-mantled Marmot	Rocky Mountain and Yellowstone National Parks.
Fisher Ground Squirrel	Sequoia, Kings Canyon, and Yosemite National Parks.
Mantled Ground Squirrel	Glacier and Yellowstone National Parks.
Sierra Golden-mantled Ground Squirrel	Yosemite, Sequoia, Crater Lake, and Lassen Volcanic National Parks.
Nushagak Ground Squirrel	Mount McKinley National Park.
Antelope Ground Squirrel	Death Valley National Monument.
Chipmunk	Yosemite, Bryce Canyon, Mount Rainier, Rocky Mountain, and Yellowstone National Parks.
Northern Red Squirrel	Mount McKinley National Park.
Sierra Chickaree	Yosemite, Sequoia, Kings Canyon, and Lassen Volcanic National Parks.

Species	*Areas*
Abert Squirrel	Grand Canyon National Park.
Kaibab Squirrel	Do.
Beaver	Yellowstone, Rocky Mountain, Glacier, Grand Teton, Mount McKinley, and Grand Canyon National Parks.
Yellow-haired Porcupine	Yellowstone, Mesa Verde, Glacier, and Crater Lake National Parks.
Pika	Rocky Mountain, Yosemite, Glacier, Yellowstone, and Mount Rainier National Parks.
White-tailed Jack Rabbit	Yellowstone and Glacier National Parks.
Black-tailed Jack Rabbit	Lava Beds National Monument.
Cottontail Rabbit	Yellowstone and many other national parks.
Wapiti	Yellowstone, Glacier, Rocky Mountain, Olympic, and Grand Teton National Parks.
Rocky Mountain Mule Deer	Rocky Mountain, Glacier, Yellowstone, and Zion National Parks.
California Mule Deer	Sequoia, Yosemite, and Kings Canyon National Parks.
Shiras Moose	Yellowstone, Glacier, Mount McKinley, Grand Teton, and Isle Royale National Parks.
Stone's Caribou	Mount McKinley National Park and Katmai National Monument.
American Pronghorn	Yellowstone, Wind Cave, and Grand Canyon National Parks.
American Bison	Yellowstone, Wind Cave, and Platt National Parks.
Rocky Mountain Bighorn	Rocky Mountain, Yellowstone, and Glacier National Parks. (Grand Canyon National Park, Death Valley National Monument, and Boulder Dam National Recreational Area.) [1]
Dall Sheep	Mount McKinley National Park.
Rocky Mountain Goat	Glacier and Mount Rainier National Parks, and Glacier Bay National Monument.

Birds

Species	*Areas*
White Pelican	Yellowstone National Park.
Trumpeter Swan	Do.
Ducks and Geese	Most national parks.
Sierra Grouse	Sequoia, Yosemite, Lassen Volcanic, and Crater Lake National Parks.

[1] Within the areas in parentheses may be seen forms closely related to the Rocky Mountain Bighorn.

Species	*Areas*
Alaska Ptarmigan	Mount McKinley National Park and Glacier Bay National Monument.
Valley Quail	Sequoia, Yosemite, and Lassen Volcanic National Parks.
Semipalmated Plover	Mount McKinley.
	National Parks.
Surfbird	Mount McKinley National Park.
Hudsonian Curlew	Do.
Wandering Tattler	Do.
American Hawk Owl	Do.
Alaska Jay	Do.
Long-crested Jay	Grand Canyon and Rocky Mountain National Parks.
Dipper	Yosemite, Glacier, Sequoia, Yellowstone, Mount McKinley, and Kings Canyon National Parks.
Black-headed Grosbeak	Yosemite, Sequoia, and Kings Canyon National Parks.

Reptiles

Species	*Areas*
Leopard Lizard	Death Valley National Monument.
Desert Tortoise	Death Valley and Joshua Tree National Monuments.

MAMMALS

PHOTOGRAPH, YOSEMITE NATIONAL PARK, OCTOBER 29, 1929.

Black Bear

The black bear is known to more park visitors than any other animal in our national parks. It has aptly been described as the clown of the woods, and many people enjoy stopping to watch the bears that often frequent the park roadsides. "Hold-up" bears take advantage of this and make it a practice to sit by the side of a road waiting to be fed.

Adult males of the species are characterized by their large size, massive frame, and rough, shaggy coat. Some individuals have a characteristic white diamond-shaped mark located on the lower part of the neck, and this mark apparently persists throughout life.

Black bears make large plantigrade or human-like tracks, and these footprints often are the most conspicuous evidence of their presence. The track of the hind foot of an average adult bear, made in firm mud, has been found to measure 8 inches in length and 5 inches in width; the track of the front foot usually measures about 5 inches in width and length. The largest tracks I have ever measured were 10½ inches long by 7 inches wide. The size of tracks made in snow are unreliable because when the snow melts they may still retain their distinct shape and yet be several inches larger than when made. Bears have a habit of stepping in the footprints of their predecessor, and when the animals are at all numerous their trails are usually a conspicuous item in the forest.

Ordinarily, black bears are silent creatures. However, when another male bear or an enemy approaches they will frequently give a low warning growl; also, when danger threatens, some adult bears will champ their jaws and click their teeth together in a menacing fashion and, upon approaching danger, a mother bear will give a warning "cough" to her cubs as a signal to climb a tree. If suddenly surprised, these animals are apt to give a snort or whistling sound, which is made by rapidly expelling their breath.

In the warm summer months bears are especially fond of taking mud baths. A large hollow Sequoia tree in Giant Forest, Sequoia National Park, is known as the "bears' bathtub" because the bears of the region frequently bathe in its water and mud-filled cavity.

Many of the so-called "bad" bears are merely those which have been spoiled, through feeding by park visitors, while they were cubs. This feeding has led them to associate human beings with food and when such food is not supplied promptly enough or in sufficient quantity they proceed to help themselves, often biting or scratching the persons feeding them. For this reason, the feeding of bears is banned by official order of the Director of the National Park Service, both as a protection to the public and to prevent pauperizing and spoiling the bears.

PHOTOGRAPH, YELLOWSTONE NATIONAL PARK, SEPTEMBER

Grizzly Bear

THE GRIZZLY BEAR may well be said to be the most famous of all wild animals native to western United States. At one time this species ranged from Mexico to Alaska. With the settlement of the western United States and the resulting persecution of this animal, the species has been exterminated over much of its original range. Today most of the remaining grizzlies are found in the national parks, where they receive adequate protection.

Although the grizzly bear was chosen as the State mammal of California, and although Dr. C. Hart Merriam, foremost authority on this species, lists seven different kinds of grizzlies from California alone, all are now believed to be extinct within the State.

Because of its cinnamon color or phase, the common black bear has frequently, but erroneously, been called "grizzly." It would be well, therefore, to set forth some of the outstanding characters of the grizzly and compare them with those of the black bear. In general, the large size, massive legs, heavy robust form, distinct hump over the shoulders, "dished" face, long, slightly curved claws, and the silver tipping to the hairs of the head and back are all good characters of the grizzly. Contrasted to this we find that black bears are smaller in size, the hump over the shoulders is less pronounced, and the old males, especially, tend to have a Roman nose instead of the "dished" face of the adult grizzly. The claws of the black bear are shorter, usually about one-half the length of a grizzly's, and much more curved. This last character is the one that enables even an adult black bear to climb trees, whereas adult grizzlies rarely, if ever, do any tree climbing. Grizzly bears show a somewhat greater variation in color than do black bears. Late in the evening of September 13, 1929, near Lake Lodge in Yellowstone National Park, I saw 16 grizzly bears all ranging in color from a light straw to nearly coal black.

I know of one instance where a black bear was caught in the act of robbing a grizzly's store of food and as a result was torn into small pieces by the grizzly. It is my opinion that many of the so-called "unprovoked" attacks on human beings by grizzlies take place because the bear fears it is being robbed.

Black bears usually make way for grizzlies whenever they appear on the scene. However, at Yellowstone I found one rather large black bear that tended strictly to its own business and fed unmolested within 2 feet of some grizzlies without their paying any attention to him. Contrasted to this, most black bears have their perches in trees all picked out long before the grizzly bears arrive. Visitors to the national parks are advised to keep a safe distance from grizzly bears and to try to see the "bear situation" from the animal's viewpoint as well as their own.

PHOTOGRAPH, CANYON LODGE, YELLOWSTONE NATIONAL PARK, SEPTEMBER 13, 1929.

Grizzly Bear (CONTINUED)

One of the outstanding attributes of the female grizzly is the wise care she gives her cubs. In the afternoon of September 11, 1929, near the canyon in Yellowstone National Park, I hid near a spot where grizzly bears were known to feed. About 3 o'clock an old mother grizzly with her two cubs came and fed peacefully within 50 feet of me. (See illustration.) This mother kept her eyes fixed intently on me, and although she could not talk, she said as plainly as any animal could, "keep your distance." I believe it would have been suicide not to have obeyed her warning. Persons should never get between a mother grizzly and her cubs, or go too close to any mother bear when she is accompanied by her cubs.

A grizzly bear's litter usually numbers two; however, one to three cubs are not rare and, occasionally, as many as four may be born in one litter. On September 13, 1939, in Yellowstone National Park, near the Lake Lodge, I found two female grizzlies, each with three cubs. One group of cubs was born that year and stood about 16 inches in height at the shoulder, and were estimated to weigh about 75 pounds each. The other litter had been born the previous year and already had a yellowish color about the head. These yearling cubs stood about 24 inches high at the shoulder and were believed to weigh about 150 pounds. A grizzly bear frequently wears a white "collar" around its neck during the first year or two of its life. About the time the cub is 3 years old this "collar" gradually disappears.

Grizzly bears are extremely fond of ground squirrels and in many cases these rodents are their chief food supply. Near Sexton Glacier, in Glacier National Park, on August 29, 1931, I found many of the characteristic craterlike mounds made by the bears in digging out ground squirrels. On less than half an acre I counted six of these places where grizzlies had been digging. One large grizzly had left a track measuring 6½ inches in width by 12 inches in length. In this track the claw marks showed plainly 2 inches ahead of the front pads of the toes.

It is my belief that about the only place in North America where we may reasonably expect to keep a native population of grizzly bears living under natural conditions is in our larger national parks, such as Mount McKinley and Yellowstone. These parks are of sufficient size to provide an adequate food supply and also room for the grizzlies to wander about without going outside the park to be shot by some hunter or stockman.

COPYRIGHTED PHOTOGRAPH BY WENDELL CHAPMAN.

Pine Marten

THE PINE MARTEN, also known as American sable, is a member of the weasel family. Compared with the mink, the marten has longer ears, legs, and fur, and a decidedly bushy tail. As in other members of this family, the adult male is distinctly larger than the female. The pine marten is about the size of a small female domestic house cat. The usual color of the marten's body is brown; the tail and feet are a darker brown, appearing almost black. The real "trade-mark" of this species is the vivid orange patch on the throat. The head of the female is often tinged with gray hairs.

In summer the marten's coat is thin and coarse, while in winter the fur is long and silky. The claws of the pine marten are strongly curved and sharp, enabling the animal to climb trees with ease and rapidity. Its toes are webbed at the base and, being flexible and furry, they spread. This gives the animal the ability to travel about in winter, whereas many other mammals would sink into and flounder about in the deep, soft snow. Martens do not hibernate in winter. Although they may den up for several days during heavy storms, they become active again as soon as the weather moderates.

The food of the marten consists largely of small rodents, such as mice, chipmunks, pikas, chickarees, and pack rats. Some birds, insects, and berries are also eaten when available. In winter, when the snow is deep and food becomes scarce, martens frequently appear at the rangers' quarters in our national parks. There, they are quick to take advantage of the protection given them, and also render valuable assistance in keeping down destructive rats and mice that congregate in the Government buildings during the winter. On May 2, 1936, at Crater Lake National Park, I watched from a distance of 6 feet a pair of martens which frequented a pile of stove wood in a winter storeroom. The head of this female was grayish, while the male was larger and dark brown without any gray on his head.

I once weighed certain tanned and dressed prime marten skins and found them to be worth their weight in gold. Because of the high value of their pelts, constant vigilance is required during the winter to prevent trappers from poaching martens inside our national parks, where they become unsuspicious and easily caught.

PHOTOGRAPH, LAMAR RIVER, YELLOWSTONE NATIONAL PARK, JUNE 25, 1940.

American Badger

THE COMMON BADGER is one of the largest members of the weasel family. An average adult of this species has a total length of about 28 inches, including the tail which is 5 inches long. Its weight is about 13 pounds, although individuals weighing up to 20 pounds have been encountered. This animal has short but powerful legs, squatty but broad body, and a short tail. The black and white facial marks, the long, shaggy, grizzled-gray hairs, the small ears, and short thick neck are all conspicuous characters. The claws, particularly of the front feet, are large (more than an inch long), slightly curved, and well developed for digging. The under parts are yellowish white with short and relatively scarce hair. Experience indicates that the eyesight of the badger is not too keen but that its sense of smell is unusually well developed.

This animal is especially adapted to "digging for a living" and is not lazy. While it spends a large portion of its existence underground digging out rodents, it travels overland from one burrow to the next. During its lifetime one of these animals will dig a surprising number of miles of burrows.

The badger works by day as well as by night. On June 8, 1930, at 4:30 p. m., near Mammoth Hot Springs in Yellowstone National Park, I spied a flat animal, about 2½ feet long, sneaking about in the grass and brush near the road. Upon investigating, I found that it was a badger hunting for ground squirrels. Its gait, as it wiggled slowly along with its body close to the ground, was similar to that of a "sowbug." As I approached, it quickly sought refuge in a shallow burrow from which, apparently, it recently had dug out a ground squirrel.

Frightened by my nearer approach, the animal ran down an old burrow. After I had waited quietly for a few minutes, it turned around and cautiously poked its head out of its underground refuge (see illustration) to see who the stranger might be. Apparently these animals have considerable curiosity.

Badgers are known for their ability to withstand the attacks of dogs and other animals. A blow that would kill a coyote or fox usually makes little impression on a badger.

The badger is one of the many animals that has profited through the continued and thorough protection afforded it in our national parks, where it aids in maintaining the natural balance by keeping down excessive numbers of rodents, particularly ground squirrels and gophers.

PHOTOGRAPH BY ADOLPH MURIE, MOUNT MCKINLEY NATIONAL PARK,

Alaska Red Fox

The Kenai red fox of Alaska is the largest and most brilliantly colored of American foxes. Its large bushy tail with the conspicuous white tip is one of the outstanding field characters. Just as we have redheads, blondes, and brunettes in a human family, we sometimes find red, cross, silver, and black foxes in the same litter.

Red foxes are fairly numerous in Mount McKinley National Park, where squirrels, rabbits, and mice occur in sufficient numbers to support a large population. The fox population varies considerably over a period of years. Since these animals are not hunted in the park, they are frequently seen in broad daylight, often at midday. Thus, on the morning of June 1, 1926, as I stood motionless, a large male fox came trotting down the trail to within 50 yards of me, apparently as much at home as a dog in its own back yard.

In Mount McKinley National Park, I found that the breeding dens of this species usually were dug in sandy knolls with sunny south-facing exposures. At each den there was a series of about half a dozen large burrows, from 8 to 10 inches in diameter, connected with each other underground. It was common to see a fox pup disappear down one burrow and suddenly reappear at the entrance to another, as much as 20 feet from the place he disappeared.

On July 8, 1932, a companion and I found the den of a red fox on a south-facing bank below the Toklat River Bridge. There were six nearly half-grown foxes in this litter—four red, one brown, and one cross. These young foxes were so inquisitive that, when we climbed up and sat down 100 feet to one side of and above the den, they soon came cautiously out of the den. One pup stood in the open looking about, another stood with his nose and tail raised sniffing the air trying to scent us, while the third moved about following the trail of his brother and sister through the sense of smell.

The red foxes at Mount McKinley catch many mice, ground squirrels, and some ptarmigan. However, the foxes have to be constantly on the alert themselves to avoid being captured by a golden eagle. For instance, at 6 o'clock one evening in July 1932, while returning home, I found a red fox lying stretched out in the short grass on the tundra and I stopped to investigate, thinking it might be sick or crippled. At first I could not understand its tameness but I was soon enlightened when I saw a golden eagle swoop down upon it. About 50 yards from this fox, I discovered a large male cross fox hiding. Upon my approach, he ran down the hill, but had only covered about 100 yards when the eagle swooped down suddenly and attempted to grasp him in its talons. Just as the eagle was on the point of striking, the fox fluffed out its tail and threw it straight up into the eagle's face as a sort of decoy. The eagle grasped the fox's tail but pulled out only hair. The eagle then arose swiftly in an endeavor to gain altitude and to strike again at the fox. The second time the eagle descended the fox escaped by making a quick jump to one side just at the moment the eagle struck. Before the eagle was able to strike a third time the fox gained the shelter of a rocky cliff and crawled hurriedly into a narrow crack. There we found him hiding, his eyes glowing like two coals of green fire. Many persons claim that animals have no intelligence or memory. In this instance, I believe that the fox knew where the crack and safety lay and that his knowledge was of survival value. The fox that failed to remember did not live to reproduce and carry on the race.

PHOTOGRAPH, ASH MOUNTAIN, SEQUOIA NATIONAL PARK, OCTOBER

Gray Fox

THE GRAY FOX has a widespread distribution in the foothills of California, and for the most part is a brush inhabitant, being found largely in the chaparral and manzanita belts. This animal is of medium size, slender streamlined design, and predominantly gray in color, with a distinct black strip extending along the top of the tail and ending in a broad black tip. It has small, sharply pointed ears, relatively short legs, and a tail more than half the length of the body. Its total length is about 37 inches; tail, 15½ inches.

The back of the species is covered with a thick coat of rather coarse gray hairs, many of which have black tips The under parts are rusty brown, changing to white on the throat, chin, and front surface of the legs.

The gray fox of California is an important fur bearer, not because its fur is extremely valuable but rather because of its wide distribution and the relatively large number trapped each year.

There is no question but that these foxes do catch an occasional quail. However, at Ash Mountain in Sequoia National Park, where there is an unusual concentration of gray foxes, the covey of quail living in the same area has continued to maintain its numbers. On an experimental range in the foothills of San Joaquin Valley—the heart of the gray fox and quail country—a recent examination showed that approximately four times as many quail nests and eggs were destroyed by ground squirrels as by gray foxes. Therefore, since the gray fox is an important enemy of the ground squirrel and other rodents which not only destroy quail eggs but also compete seriously with these game birds for food, it would seem that, by keeping down the rodents, the foxes are beneficial rather than harmful to the valley quail.

In catching these rodents, it is obvious that foxes must hunt during the hours the mice and squirrels are most active. However, the foxes' activities are not restricted to nocturnal hours; frequently they are found abroad early in the morning and late in the afternoon.

A trapper in San Diego County, Calif., caught 18 gray foxes in an area covering less than 3 square miles. He said the foxes had congregated about a small ranch, where they were attracted by the numerous rats, mice, gophers, and other rodents that were feeding on the rancher's growing grain.

PHOTOGRAPH BY ADOLPH MURIE, YELLOWSTONE NATIONAL PARK,

Coyote

THE COYOTE, sometimes known as "brush" or "prairie" wolf, has been called the original or native wild dog of western North America where it is now found from central Alaska to southern Mexico. This wandering canine was well known to certain primitive types of Indians long before the coming of the white man. This is clearly indicated by the permanent place that the coyote has been accorded in the animal folklore and the traditions of the various tribes of Plains Indians. However, the Indians apparently did not accord the coyote an exalted place in their animal folklore, but rather seemingly regarded him as a sort of scapegoat.

A coyote resembles a small collie dog in general size, form, and coloration. Three types of coyote are usually recognized in the West. The smallest of these is the scrawny desert coyote which usually looks as though it never had a square meal. The short, coarse hair of a reddish cast which clothes the desert coyote adds to its unkempt appearance. Contrasted to this, the coyote of the high mountains is a large, robust animal with a dense coat of long, grayish fur. The mountain coyote frequently is called a "gray wolf" which is, however, a larger, stouter animal with heavier teeth and larger feet. The valley coyote is intermediate in size between the desert and mountain types, being nearer the latter in both size and color.

The mountain coyote is stronger and bolder than its lowland relatives which feed more largely on carrion, and at times captures deer and other large prey, especially during the winter when the ground is deeply covered with snow and food is scarce.

The weird voice of the coyote is to many people one of the most distinctive animal calls to be heard in our entire country. While coyotes usually bark most at or near sunrise or sunset, they are often heard at night and sometimes even at midday. Like domestic dogs, the coyote responds by howling when a steam whistle or other loud sound is produced at a certain pitch or key. It is thought by some that the sound vibrations affect the inner ear of the coyote so that he howls possibly to relieve the pain of the vibration. Frequently I have watched a pair of coyotes and found that they were able to so modulate their voices that the uninitiated person would swear that there were no less than a dozen coyotes barking. Close observation has shown that the usual "pack" of coyotes consists of merely one family—just a pair of adults with their grown offspring. Much of the western country would be drab, dry, and dusty indeed if it were no for the "singing" of the coyotes.

Coyotes often locate their dens in burrows which the mother digs in open sandy ground before the young are born. The number of coyote pups in a litter varies from 3 to 9, with an average of 6. One litter a season is the normal reproduction.

Mountain Lion

THE MOUNTAIN LION is often called cougar, puma, panther, painter, and catamount, according to locality. Adults usually have a rather uniform tawny or grayish body color without spots. However, the young kittens are coarsely and sharply spotted with dark brown, almost black, spots over most of their bodies. These juvenile spots usually disappear by the time the young reach an age of 6 months, but some kittens retain their spotted coat until they are nearly a year old. Both adult and young mountain lions have long tails. Young kittens have their tails crossed by several black bands. In the adults the tails are not banded, but have a distinct dark brown terminal tip.

There are two color phases in mountain lions. Some adults have a tawny or reddish color, while others are of the gray phase. However, unlike summer and winter coats of deer, the color phases of mountain lions do not change markedly with the season. A "red" individual is red throughout its life. Average adult mountain lions have a total length, nose to tip of tail, of from 6 to 8 feet. The long tail averages 2 to 2¾ feet. Males are larger than females and have an average weight of 150 pounds, against an average of 90 pounds for females.

Mountain lions raise only one brood of young a year and the breeding season is extended, young kittens having been found during every month of the year. Kittens vary from one to four in a litter. There is much conflicting evidence regarding the "scream" of the mountain lion. After spending 30 years in close contact with mountain lions in the forests of the West, I have come to the conclusion that 99 percent of the alleged panther screams are really made by some other animal.

Deer constitute the staff of life of the mountain lion, and it is largely because of this that hunters are employed by State and Federal authorities to keep the mountain lions from becoming too numerous. In the Western States, some domestic stock is also killed by mountain lions but investigation in California has shown that most of the killing of domestic cattle and horses is done by a relatively few individuals, usually large old males that have turned "killers" and remain so until they are tracked down and eliminated. It is felt that every possible means should be used to end the lives of such destroyers. However, less than 15 percent of the lions killed and examined by State Lion Hunter J. Bruce have had remains of domestic stock in their stomachs. When a hardened criminal escapes from a State prison, the police do not start shooting every person they encounter. Selective hunting for "killer" lions should be employed rather than "scatter gun" methods.

The national parks are perhaps the only areas where we can expect to keep even a small portion of this country's original mountain lion population.

PHOTOGRAPH BY OLAUS J. MURIE, ELWHA RIVER, OLYMPIC NATIONAL PARK, FEBRUARY 1917.
COURTESY OF FISH AND WILDLIFE SERVICE

PHOTOGRAPH, LAKE LODGE, YELLOWSTONE NATIONAL PARK, JULY

Golden-Mantled Marmot

THE GOLDEN-MANTLED MARMOT is a rather common resident in Yellowstone National Park. On July 1, 1930, at Lake Lodge, we found these animals plentiful and exceedingly tame. In fact, the tameness of several of the old marmots was almost unbelievable. Four youngsters, which at that date were about the size of a large ground squirrel, were playing in the gravel and enjoying the warm rays of the morning sun. Some of the rodents had dug holes under the floor of the main building and two of the old ones had their burrows under the loading platform where they were always on hand to greet all arriving guests—a self-appointed reception committee.

This group of marmots appeared to have lost all their native fear of man for they came out, stood up on their hind legs, and begged for food. On the day previous to our visit a little boy was walking along carrying a paper bag full of popcorn and one of the old marmots went up to him, seized the bag, and ran off with it, leaving the little fellow crying. Some of the old animals were so fat and lazy they could scarcely waddle about and reminded me of certain old fat bears in their nonchalant way of disregarding danger. The young were much more alert and watchful for danger than their parents.

This species of marmot is about the size of, and bears a general resemblance to, the ordinary woodchuck of the eastern United States. The adult males have a total length of about 27 inches; tail, about 6½ inches.

The color of these animals is ochraceous above, with a golden, buffy mantle extending across the back and shoulders, and distinctly reddish below. In Grand Teton National Park on July 7, 1931, many of these animals were observed at an elevation of 7,000 feet. These marmots were in their dark red coats.

Like other members of the woodchuck family, the golden-mantled marmot hibernates during the colder months. Two of these rodents were observed to be out of their winter den by April 12, 1932.

The natural enemies of these rodents are the coyote and golden eagle. Both of these animals capture a good many marmots, especially the younger, more inexperienced individuals. In spite of the toll taken by natural enemies, this species continues to maintain its numbers, since the rate of reproduction is sufficient to cover the loss.

PHOTOGRAPH, CAMP KAWEAH, SEQUOIA NATIONAL PARK, SEPTEMBER 14

Fisher Ground Squirrel

THE FISHER GROUND SQUIRREL is frequently known as the "digger" squirrel because of its habit of digging extensive burrows in the alluvial soil. It is a large, heavy-set squirrel, about the size of a regular gray squirrel, with a moderately bushy tail. The ears are comparatively small, and the tail is much narrower than that of the tree squirrel. The general coloration of the upper parts is mixed gray and light brown, with a definite mottled pattern on the back and rump. There is a white silvery patch over the shoulders, and the long hairs of the tail have white tips. The total length is about 17 inches; tail about 7 inches.

The digger squirrel formerly occurred in great numbers over the plains of the San Joaquin Valley in California. With the settlement, irrigation, and cultivation of much of this area, the squirrel population in the valley was reduced or crowded into the noncultivated land in the adjacent foothills. There it has taken advantage of human association, increased its numbers, and extended its range back into the mountains by following along the regular pack trail routes.

This species is clever at letting other squirrels do the hard work. Many times I have watched one waiting on the ground beneath a tree in which a chickaree was cutting and dropping the large green cones of the western yellow pine. Whenever the digger squirrel heard a pine cone hit the ground he would rush over and carry it off to his own den. When the chickaree came down the tree he was surprised to find that the cone, which he had just cut, had "walked off."

Digger squirrels have a high rate of reproduction. From 3 to 11, with an average of 6 young, are born in a litter. These young squirrels mature rapidly and are able to leave their underground burrows within a few weeks after birth. Frequently their dens are located under logs or between boulders, apparently in order to give better protection from badgers and other natural digging enemies. Digger squirrels are the basic food supply of many carnivorous birds and mammals of the West. They form the staff of life for the western red-tailed hawk and golden eagle and are extensively preyed upon by coyotes, wildcats, and gray foxes.

PHOTOGRAPH, GLACIER NATIONAL PARK, JULY

Mantled Ground Squirrel

THE MANTLED GROUND SQUIRREL is a resident of parks in the Rocky Mountains, particularly Glacier National Park. It is most conspicuous around trail camps, chalets, and other stopping places, where it is quick to take advantage of food supplies, in the form of spilled grain or table scraps, provided by man.

These squirrels are of medium size, being about half way between the size of a chipmunk and the ordinary ground or digger squirrel. They have a chunky body, fairly short and rounded ears, and flat, bushy tails. Their total length, from nose to tip of tail, is about 11 inches; the tail, 4 inches, or about half as long as the body.

Because of the black stripes extending along either side of these animals they are sometimes spoken of as big chipmunks. These stripes do not involve the head as they do in the case of the true chipmunk.

The food of these little rodents consists of plant seeds, grain, buds, green vegetation, and insects and their larvae. Occasionally they will eat young mice or nestling birds and birds' eggs.

Mantled ground squirrels have many enemies, and are a favorite food of hawks, coyotes, foxes, and badgers. On July 27, 1929, at Lundy Pass, at an elevation of 10,500 feet in the Sierra Nevada, I had the unusual opportunity of watching a Sierra red fox attempt to capture one of these squirrels. The red fox was observed as it suddenly bolted out of a thicket of dense, scrubby, white-barked pine. From the suddenness of its appearance, I thought it had been fighting and was driven out by another fox. To my surprise, however, it circled around a clump of trees and rushed back into the thicket. In about 10 seconds a mantled ground squirrel rushed out of the same thicket and ran for dear life to the shelter of a large granite boulder 25 feet distant in the open meadow. Closely pursued by the fox, the squirrel managed to reach his burrow under the boulder, just 6 inches ahead of the fox's jaws which clicked audibly right at his heels. This incident shows the value of cracks in rocks, or burrows under rocks, and how importantly they serve as safety zones to these squirrels.

PHOTOGRAPH, CRATER LAKE NATIONAL PARK, SEPTEMBER

Sierra Golden-Mantled Ground Squirrel

GOLDEN-MANTLED GROUND SQUIRRELS are found in the mountains of southern Oregon and south along the Sierra Nevada to central California. They are among the outstanding mammals at Crater Lake National Park. Not only do they occur in considerable numbers, but the contrasting markings, the broad white stripe bordered on either side by a darker stripe, together with the golden color of their head, neck, and shoulders, make these rodents particularly noticeable. In addition to the brilliant coloring, their habit of quickly making friends with humans and of exploiting this friendship forces these animals upon the visitors' attention.

The mantle of this species is a rich, rusty chestnut color; the back gray, grizzled with light brownish and blackish; the under parts vary from grayish to almost white; the relatively short tail is yellowish below. These animals have a chunky body and a total length of about 11 inches, including the tail which is about 4 inches long.

Mating season is in the early spring soon after they come out of hibernation. The young, which number from three to five in a litter, are usually born in June. By this time the annual grasses and other vegetative growth are sufficient to provide them with abundant food during the summer months. On the approach of fall they harvest great quantities of pine seeds which become available at that time through the opening of the cones on the pine trees. These ripe seeds are carefully gathered, transported in their cheek pouches which serve as pockets, and stored up in hidden caches in hollow logs, or in their burrows, for the proverbial "rainy day." They also eat many pine nuts as they work and thus store surplus fat in their bodies. One squirrel that I watched at Annie Spring Checking Station at Crater Lake in the fall of 1936 not only stuffed his cheek pouches so full of nuts that he looked as though he had the mumps (see illustration), but at the same time he ate so greedily that there were rolls of fat beneath his skin, particularly at the base of his tail. So greedy was this little squirrel that we called him "Stuffy."

Nushagak Ground Squirrel

Pioneers of Alaska commonly call these rodents "parka" squirrels because the native Indians and Eskimos make their summer parkas or coats from their pelts. The Eskimo name for this ground squirrel is "sic-sie," and that for the hoary marmot "sic-sic-puk" or big ground squirrel.

A parka squirrel weighs about a pound and measures 14 or 15 inches from end of nose to tip of extended tail. The tail is about 4 inches long and is used as a prop or support when the squirrel sits upright in its characteristic "picket-pin" pose. Its ears are short and lie close to the head. In fresh fall pelage the squirrel's color has a grayish cast, but in summer coat the cheeks, forehead, and under parts all acquire a rusty tinge.

"Parka" squirrels become fat in late summer and usually go into hibernation for the winter early in October. They remain in hibernation under the snow for 6 months and do not reappear until the following April. Although excessively fat when they enter their long winter sleep, they emerge in the Spring so hungry!

By June, five to eight young have been added to the squirrel family. These youngsters grow rapidly, and in July each may be found independently seeking its own food. It is necessary that "parka" squirrels have large families because they are preyed upon by so many birds and animals, such as golden eagles and Alaska red foxes. These lowly ground squirrels are an important food for the large and powerful Toklat grizzly bear.

On July 2, 1926, at Sable Pass in Mount McKinley National Park, I watched a large female grizzly and her two cubs harvesting ground squirrels. The mother bear would chase a squirrel into its burrow and then, after tramping in all nearby squirrel burrows so that it could not escape, she would proceed to dig it out. First, she removed the sod and earth covering of the den with a few strokes of her powerful paws, then reached in, grasped the struggling victim in her teeth, and dragged it forth. Meanwhile the cubs stood expectantly close by, seemingly realizing that dinner was about to be served.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JUNE 20, 1926.
COURTESY OF MUSEUM OF VERTEBRATE ZOOLOGY.

PHOTOGRAPH, WILDROSE CANYON, DEATH VALLEY NATIONAL MONUMENT, SEPTEMBER

Antelope Ground Squirrel

One of the most conspicuous small desert animals that a visitor is likely to encounter at Death Valley National Monument is the antelope ground squirrel. This little rodent makes its home in the dry arid plains of the desert where the rainfall is scant and vegetation sparse. It is easy to recognize by the manner it carries its tail curved up over its back when it runs or flees from danger. The similarity of its white tail to the white rump patch of the pronghorn is the character that gives this animal its name of antelope ground squirrel. This squirrel has a total length of about 8½ inches; tail about 3 inches. It is slightly larger than the chipmunk found in the eastern United States. There is a single long white stripe down each side of its body; the tail is short, flat, and narrow.

The antelope ground squirrel has internal cheek pouches which serve as pockets to carry the seeds of desert plants. These seeds are stored up in times of harvest against the many long months when green vegetation is sparse. Another character of this animal is its fine call note. This call note reminds me of the katydid and frequently I have mistaken it for that of some insect.

These squirrels are said to have more than one litter of young a season. However, it has been my experience that normally one litter numbering from 3 to 8 is the average family raised by this species.

The antelope ground squirrel has a roving disposition and travels over several acres in the course of its day's search for food, but it usually has a definite home burrow to which it returns at night. Many times I have seen what appeared to be a bit of white cotton or down blowing along on the ground, but investigation proved that it was the white tail of an antelope ground squirrel. The gray body of this little animal blended so completely with the desert sand that all but the tail was practically invisible at a short distance. One that I followed at Wildrose Canyon, Death Valley National Monument, eluded me for hours by keeping a bush between us. Ultimately, however, I was fortunate enough to secure a photograph when the animal ran across a rock pile and stopped momentarily to view its pursuer.

PHOTOGRAPH, TOWER FALLS, YELLOWSTONE NATIONAL PARK, SEPTEMBER 16,

Chipmunk

THE LITTLE STRIPED CHIPMUNK is a dainty, frisky squirrellike rodent characterized by a slender body and a flat tail which is less than half the total length of the animal. Its outstanding field character is the striped back, consisting of five dark and four light stripes extending from the shoulders to the base of the tail. In chipmunks, the head is striped as well as the body, while in ground squirrels only the body is striped. The belly is whitish. The ears are narrow and erect. There are many varieties of striped chipmunks in the mountains of the western United States.

Seeds, buds, fruits, and insects form their chief articles of diet, but bird eggs are considered a delicacy. Chipmunks, being good climbers, ascend trees readily and have been watched as they actually raided the nests and carried off the eggs.

The striped chipmunks are welcome visitors at the woodsman's or vacationist's camp in the mountains. They soon learn that discarded table scraps are their special bounty and are usually on hand promptly at meal time.

One time, when I was having great difficulty in procuring a photograph I wanted of a chipmunk climbing a pine tree, I was just about to give up in dispair when a pigeon hawk came flying through the woods in search of food. As the hawk flew by on the side of the tree opposite to me, the chipmunk scurried around the tree in great haste, flattened itself out on my side of the tree and remained motionless to escape the hawk, enabling me to obtain the desired photograph.

On April 14, 1935, at Lodgepole, Sequoia National Park, I found chipmunks out of hibernation and active, although the snow still lay from 3 to 3½ feet deep on the level.

The breeding season starts a few weeks after the chipmunks come out of hibernation and then they begin building their nests. These nests, in which the young are born, are often located in cracks between rocks or in old woodpecker holes or other tree cavities. Usually they are lined with fine strips of bark or plant stems which have been cut into shreds by the chipmunks.

At Tower Falls, in Yellowstone National Park, where these chipmunks are numerous, they may be seen harvesting grass seeds which they strip and gather with their front paws. Some of these seeds are eaten immediately; others are deftly stowed in the cheek pouches inside the mouth. These cheek pouches, which serve as pockets, are exceedingly helpful in aiding these animals to gather, transport, and store their reserve food supply of seeds.

The average chipmunk family consists of the parents and four young. A relatively high rate of reproduction is necessary to maintain their numbers, because these rodents are preyed upon by weasels, hawks, pine martens, and other enemies.

PHOTOGRAPH, IGLOO CREEK, MOUNT MC KINLEY NATIONAL PARK, JUNE 10, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZOOL

Northern Red Squirrel

The northern red squirrel is a tree dweller closely related to, and about the size of the common red squirrel in the eastern United States. It is an inhabitant of the spruce woods of Alaska and northern Canada and sometimes is called "spruce" squirrel. The hearty "chir-r-r" of this little animal adds greatly to the charm of these silent forests. It remains active in winter as well as in summer and is especially appreciated when the trees are deeply covered with snow.

A close view shows that this animal has a striking white ring around each eye, also a flat plumelike tail which is almost as long as the body. Its claws are sharp, curved, and well adapted for tree climbing. In summer, the back of this squirrel is a vivid brick red and it is this distinctive character that gives the animal its common name; the under parts are yellowish white. The ears are slightly tufted in winter but in summer these tufts are lost. This animal has a total length of about 12½ inches; tail, 4½ inches.

In winter, their spherical nests of shredded bark, fibrous roots, and moss are placed in a sheltered spot, usually well up in a tree. One nest that I examined was more than a foot in diameter and had walls 4 inches thick. An entrance hole in the side of this nest led to a snug warm inner cavity, lined and insulated with caribou hairs and ptarmigan feathers.

As the northern red squirrel does not hibernate, it must lay up a winter food supply. Before the spruce cones are open in the fall, these little rodents cut off hundreds of these cones and store them in their winter cupboard in the damp cavity of a stump or beneath a log. Here they are preserved, unopened by the moisture and cold. Dried mushrooms and other choice titbits also are carefully tucked away in crevices or in between the main trunk and some branch of a tree. I once watched one of these squirrels drive a pair of Alaska jays, commonly known as "camp robbers," away from a certain spruce tree. Five minutes after the jays departed, the squirrel cautiously removed a piece of old mouldy cheese that it had stolen from our camp and carefully rehid it in a new place so the jay would not find it. The spruce trees provide food, shelter, and a safe home for these little animals throughout the cold, snowy months.

PHOTOGRAPH, SUNSET ROCK, SEQUOIA NATIONAL PARK, SEPTEMBER

Sierra Chickaree

The Sierra chickaree is a small tree squirrel with a total length of 13 inches including the tail which is 5 inches long. The tail is flat and bushy with a white or yellowish fringe around the margin. The ears are well developed and, in full coat, tipped with fairly long hairs. These hairs, however, are not as long as on the Kaibab and some other tufted-eared squirrels.

This species has two coats each year—one in summer and one in winter. In the summer coat, the upper part is dark brown with a tinge of red down the back. A black line extending along both sides separates the whitish or buffy under part from the brown back. There is a distinct white ring extending above, below, and behind the eyes.

The call of the chickaree is a short explosive note, repeated at frequent intervals, which may well be described as "quer-o." Often, when giving this quer-o call, the animal makes short spasmodic jumps and at times twitches its tail violently each time the note is uttered.

John Muir, the poet of the Sierra, had an outstanding love for this little squirrel, and his journals contain many references to it. In fact, its active nature and cheery call give life to the dark coniferous forest where it spends most of its life in the trees. Armed with sharp curved claws on all four feet, the chickaree is able to run rapidly up and down the vertical trunks of these trees with seemingly little effort.

Since many green cones that are cut are too large to carry, being almost as heavy as the animal itself, the chickaree makes every effort to find the nearest possible protection. In many instances the cone is dragged to the base of the nearest tree, where the squirrel can work on it at leisure.

The chickaree has many enemies. Since it remains active and runs about all winter when the ground is deeply covered with snow, hawks, owls, pine martens, and coyotes are among its more important natural enemies. On January 13, 1935, at Giant Forest, Sequoia National Park, after a seasonal snowfall of 33 inches had left the meadows covered with a deep blanket of white, I found a series of fresh marten tracks. These had been made the previous night or early morning and showed that the marten had been stalking chickarees which, at that time, were actively running about, up and down and between the tree trunks. In traveling across the snow, the marten and chickarees both sank into it for a depth of 2 inches at each step.

PHOTOGRAPH, SOUTH R.M. GRAND CANYON NATIONAL PARK. NOVEMBE

Abert Squirrel

The Abert squirrel resembles a large gray squirrel in size but has a heavier body. Abert and Kaibab squirrels belong to the tufted-ear group of squirrels and have, as one of their outstanding characteristics, blackish hairs extending upward from the ears, which give these members a distinct tufted appearance. They are unique among North American squirrels in this possession of tufts of long hairs on the ears, and in this respect resemble certain tree squirrels of northern Europe and Asia.

The upper parts of the Abert squirrel are grizzled gray, with a broad rusty band extending down the back; a black line extends along either side of the animal; the under parts and feet are whitish; the tail is dark gray above and white on the under surface. These squirrels have an average length, from nose to end of tail, of about 21 inches; tail, 9 inches long.

They construct large nests of twigs, pine needles, and leaves in protected situations in the tops of yellow pine trees. Sometimes, they make use of hollow tree trunks for homes. Unlike many of the ground squirrels, they do not hibernate, although they may be inactive for a few days during extremely cold weather.

Usually, Abert squirrels have litters of three or four. However, they have cyclic seasons of abundance, and following a series of favorable seasons may become quite numerous. At such times several may be seen together, while during poor seasons only single individuals will be encountered. Many of them were reported in the Grand Canyon area during the fall of 1930, which was said to mark one of their periodic seasons of abundance.

Abert squirrels eat the seeds of pine trees as well as the acorns from oaks. They also frequently eat the under bark from the twigs and small limbs of the pines. Nestling birds and eggs are eaten when they are available.

PHOTOGRAPH, GRAND CANYON, ARIZONA, JUNE

Kaibab Squirrel

THE KAIBAB SQUIRREL is one of the rarest mammals in the national park system. It is found on the Kaibab plateau, on the North Rim of the Grand Canyon, and is native to no other part of the world.

Near Bright Angel Point I found a Kaibab squirrel running about on the ground in a grove of quaking aspen. I followed this little animal for nearly a quarter of a mile until it reached its "nest" tree. The nest was built in the fork of a large bushy western yellow pine about 40 feet above the ground. Here the squirrel had garnered and piled a large quantity of dry branches of the yellow pine to form a nest approximately 2½ feet in diameter by 3 feet in height. I noticed, while this squirrel was up in the tree, its long white tail waved like a pendulum below the limb on which it was sitting. At other times it remained motionless and hid by crouching lengthwise of the limb with its tail tightly pressed against its back. It is believed that the tail, when thus held over the back, helps to conceal the animal when viewed from above, as by a hawk.

The young squirrels are born in a small central chamber of this bulky nest during the latter part of June. The litters are known to vary from two to six. Only one brood is born each year.

Kaibab squirrels are much quieter than gray squirrels; also, in going from tree to tree, the Kaibabs travel more on the ground instead of from limb to limb like the gray squirrels.

The Kaibab squirrel lives almost exclusively on the cambium layer of the second year growth of the yellow pine. Only the terminal twigs of vigorous healthy yellow pine are chosen and the rough outer bark is removed to reach this cambium layer. I have counted the remains of more than 500 of these terminal twigs, about the size of a lead pencil and from 4 to 10 inches in length, on the ground beneath one tree.

Goshawks are believed to be the outstanding enemies of the Kaibab squirrel. Coyotes also catch a few of these squirrels each winter.

While this squirrel feeds, its tail is curled up over its back in characteristic fashion. (See illustration.) This posture reveals that the tail is white all around. Because of this, the Kaibab squirrel is known locally as the "white-tailed" squirrel.

Since the Kaibab squirrel is unique and has a restricted range, the National Park Service, the United States Forest Service, and the State of Arizona have entered into a cooperative agreement whereby the animal is given strict protection. It is hoped that success will follow this effort to preserve this unique species for the enjoyment of future generations.

PHOTOGRAPH, SNELLING, MERCED COUNTY, CALIF., FEBRUARY 26, 1920. COURTESY OF MUSEUM OF VERTEBRATE ZOO

Beaver

THE BEAVER is the largest rodent native to North America. Formerly, it was found near lakes and streams throughout most of the wooded sections extending from Alaska to the Rio Grande. Today the boundaries of the range are almost as extensive, but large areas are unoccupied.

It is an aquatic mammal with a robust body, a broad, flat, scaly tail, and short ears. The hind feet are strongly webbed between the toes and there is a double claw on the second toe. The pelage is composed of long, coarse overhairs and a short, soft underfur. An average adult has a total length of about 42 inches; tail, 16 inches long and 4 inches in width; weight about 45 pounds. The males and females are so similar in size and color that it is difficult to distinguish between them in the field.

These rodents spend most of their lives in or near the water and their home frequently consists of a burrow dug in some bank on the margin of a lake or stream. Beavers with this type of home are known as "bank" beavers. Other individuals, who build their "houses" out of sticks, stones, and pieces of saplings which they cut, drag, and pile up on the bank of a river or lake to form a large haycock, are known as "lodge" beavers. However, the same individual may build a "house" or dig a burrow according to the building site and conditions. The entrance to this lodge or house is through a tunnel that leads from an under-water opening to the center of the house. Thus, whenever danger threatens, the beaver is able to enter and leave its home without exposing itself above ground or water and thereby escapes the attacks of many of its enemies.

Beavers construct dams of sticks, branches, rocks, and earth across quiet streams and along the margins of lakes. Usually, they do this to impound additional water or to maintain the water at a constant level, in order to protect the entrance to their homes. Sometimes it is done to maintain a certain depth of water in the canals which they occasionally dig as a means of transporting limbs or branches of trees which they have cut for food.

The beaver shows considerable foresight in storing its winter food supply, particularly in regions where the ponds and lakes freeze over. Aspen and willow bark are favorite foods of this animal. To secure a year-round supply the beaver, in the fall, cuts many willow and aspen saplings and drags them through the water to his lodge, which usually is situated adjacent to deep water. Here the animal piles or anchors the green saplings and limbs at the bottom of the stream or lake adjacent to his home. Then, in midwinter, when the pond, lake, or stream is frozen over, the beaver is able to go from his house down under the ice and drag back into his den a branch or limb which provides a meal.

PHOTOGRAPH, LAMAR RIVER, YELLOWSTONE NATIONAL PARK, JUNE

Yellow-Haired Porcupine

Amongst the rodents of North America, the yellow-haired porcupine is exceeded in size only by the beaver. The outstanding character of this animal is its armored coat of sharp pointed black tipped quills which are barbed at the end and so loosely attached to the animal's skin that they are easily broken and carried away by anything that comes in contact with them. The porcupine is a slow-moving rodent with a waddling gait and seldom hurries to get out of one's way.

An average porcupine has a total length of about 32 inches; tail, exclusive of hairs, about 6 inches. It has a robust body, short ears almost hidden by surrounding hair, and short legs armed with strong claws. The food of the porcupine consists of buds and bark of many trees and shrubs. In the West, in winter, it lives principally upon the inner bark of the pine tree. Porcupines apparently have a low death rate. This is evidenced by their low rate of reproduction—usually one or two young are found in a litter.

The porcupine is not so inoffensive as it seems, and apparently is aware that it is well protected by the hundreds of spines bristling along its back and tail. These spines, which constitute a deadly weapon, frequently are camouflaged by long wisps of yellow hair that stream out over the head and back of the animal. Many persons believe that the porcupine can "throw" its quills. It is true that when switching its spiny tail back and forth an occasional quill may be dislodged and thrown off, but the animal does not consciously "throw" these barbed quills at its enemies. The porcupine's most characteristic method of defense consists in filling its enemy full of quills by slapping the venturesome intruder with its well-armed tail. Many a mountain lion that I have examined after it was killed had the quills of a porcupine embedded either in its paws or the forward part of its forelegs.

In addition to being protected within the national parks, porcupines frequently are protected in the forests of the Far North because they are about the only animal that can be killed with a club when people become lost in the woods.

Cliff Palace, in Mesa Verde National Park, Colorado, formerly was the home of a group of porcupines that had found safe breeding dens in the cracks and crevices of the shelving rock. Through the protection thus afforded, these animals increased until they had a relatively large population at this focal point. As a result, the few piñon pines and junipers in the vicinity not only were badly gnawed, but many of them were killed by the excessive depredations of these animals.

PHOTOGRAPH, LINCOLN PEAK, GLACIER NATIONAL PARK, AUGUST

Rocky Mountain Pika

The Rocky Mountain pika closely resembles a diminutive rabbit and is a close relative of the rabbit tribe. An outstanding difference is that rabbits have no thought for the morrow and do not lay by a food supply for winter while the pikas gather and store up food late in summer and early in fall to be used when the country is covered with a heavy blanket of snow.

This species is about the size of a small guinea pig, with a chunky body, small rounded ears, and bobbed tail. It has a length of about 7½ inches; tail, practically nil. The soles of the feet are densely haired so that even during the coldest weather it is able to hop noiselessly about in its rocky home without getting cold feet.

If it were not for their shrill little "bleating" cries, pikas would quite escape detection because their gray color blends so perfectly with the granite rocks amid which they live. Possessing a keen sense of sight and of hearing they are quick to discover any approaching danger and immediately pop back into their dens.

These little animals are inhabitants of the broken rock slides on the talus slopes of the higher Rocky Mountains. At Lincoln Peak, Glacier National Park, on August 12, 1931, I found a pika at the entrance to his home taking a sun bath in a pile of broken rocks. Though timid, it remained, quietly watching me and twitching its nose, evidently attempting to ascertain what kind of a strange venturer had invaded its mountain home. Although the winter was still far distant, this pika was beginning to cut and gather some of the alpine plants which grew in a little meadow near its home. I found that several different varieties of plants had already been harvested. Then, when the winter snowstorms come and the landscape is buried beneath a deep white blanket, the pika, instead of having to "dig" for his dinner, is able to run about all winter through the underground passages and cracks, amid the broken rocks that form his home. Protected by a solid roof of snow and kept warm by his thick gray overcoat and warm fur slippers, he sits comfortably at home with a well-earned food supply.

PHOTOGRAPH BY GEORGE M. WRIGHT, MAMMOTH HOT SPRINGS, YELLOWSTONE NATIONAL PARK, APRIL 2

White-Tailed Jack Rabbit

The white-tailed jack rabbit is a large hare, and may be distinguished from other jack rabbits at all seasons of the year by its conspicuous white tail. This species has a heavy body, relatively large ears, and long hind legs. Total length about 24 inches; tail, about 4 inches.

Although large and relatively long, under ordinary conditions this animal is inconspicuous and rarely seen because when approached it often clamps its tail over its rump, flattens down its ears, and crouches motionless in order to escape notice. However, when listening, it stands erect.

The winter pelage of the white-tailed jack rabbit is pure white except for the black tips to its ears and a few buffy patches on the upper portion of the forefeet and about the ears and eyes. During the summer the general coloration of its body is a buffy gray, with sometimes a yellowish or brownish suffusion. In spring and fall these rabbits are in a transition shade between winter and summer colors.

During the latter part of June 1930, at Mammoth Hot Springs, Yellowstone National Park, I observed seven white-tailed jack rabbits in one day, and most of these had changed from their winter to summer coat. Three of these rabbits were feeding on the green lawns near park headquarters, two were feeding in a meadow near the buffalo paddock, and the other two were feeding on a pile of fresh green grass. One female that I watched showed a decided preference for the flowering stalks of dandelions, while another individual crouched in the grass and ate clover stems.

In Rocky Mountain National Park, on August 7, 1935, a white-tailed jack rabbit was seen at Tundra Curves on the Trail Ridge Road, at an altitude of 12,000 feet. On August 18, in the same general locality, another individual was observed at an altitude of 11,500 feet. This species appears to be increasing in numbers at Rocky Mountain National Park.

PHOTOGRAPH, LAVA BEDS NATIONAL MONUMENT, MAY 9,

Black-Tailed Jack Rabbit

THIS SPECIES OF JACK RABBIT has a large body, large ears, long hind legs, and tail black above. It has a total length of 23 inches; tail 4 inches.

The black-tailed jack rabbit is a conspicuous member of the wildlife at Lava Beds National Monument, particularly in the rocky and sandy areas along the boundaries of the monument where clumps of rabbitbrush afford it shelter during the heat of the day and, apparently, serve as a source of food when other forage is scant. It was here that I played hide-and-seek with one of these rabbits while I attempted to secure the photograph on the opposite page.

Unlike cottontail rabbits, jack rabbits or hares are born fully furred and with eyes open. The young leave their nest within a few days but they have so many enemies, such as hawks, coyotes, and owls, that many of them never reach the adult stage.

Ordinarily, this jack rabbit depends upon making its escape through fleetness of foot and it usually jumps from its daytime nest when an intruder is several yards distant. These daytime nests, known as "forms," consist of a long narrow depression scratched out under the protection of some bush or bunch of grass. When resting, the animal crouches motionless in this nest, and its gray sides and back blend so well with the surroundings that it is difficult for an enemy to see it.

The outstanding enemies of the jack rabbit are the golden eagle and the coyote. I once watched an eagle in pursuit of one of these animals which I had accidentally frightened from its daytime nest. The jack rabbit had started off at great speed when, suddenly, there was a hiss of wings and the eagle, like a thunderbolt out of the sky, shot after the rabbit. Just as the bird was about to strike its prey the animal dashed into a dense protecting bush. There it remained and the eagle was unable to frighten it out into the open again.

PHOTOGRAPH BY FISH AND WILDLIFE SERVICE, NEAR NORTH ENTRANCE, YELLOWSTONE NATIONAL

Cottontail Rabbit

THE COTTONTAIL RABBIT is the most widely distributed of all the various kinds of rabbits in the United States. Jack rabbits are most numerous and characteristic of the open plains of the West, whereas the cottontail occurs in practically all sections of the United States. It is of medium size, about 13 inches in length, with a short, conspicuous white tail about 2 inches long, from which it gets its name. The ears, which are so large and conspicuous in the jack rabbit, are only of medium size in the cottontail, averaging about 3 inches in length. A full grown cottontail in good condition weighs about 2 pounds.

There are three general types of cottontails found in the United States. The range of the eastern cottontail extends from Florida along the Atlantic coast as far north as southern New England. This type is also found generally over the Mississippi Valley. The type found in the Rocky Mountain region is a slightly smaller form. The western cottontail is found along the Pacific coast.

Jack rabbits at birth are covered with hair and, being precocious, are able to run about at an extremely early age. Contrasted with this, cottontails are born naked, with eyes closed, in a well-made nest where they are suckled and tended for several days before they become fully furred and able to leave the nest and run about.

Cottontails are important elements in the animal life of a community because they provide food for a large variety of hawks, owls, foxes, coyotes, bobcats, and other meat-eating animals, to say nothing of the sport and food that they provide for man. In this connection it should be pointed out that the cottontail rabbit, although of relatively low estate, provides sport and food for many farmer boys and other persons who are not able to go hunting for big game. In a similar way, it is of relatively great importance in the national parks because of its food value for native meat-eating animals. On account of a relatively high rate of reproduction, the cottontail usually succeeds in maintaining itself in spite of pressure from human hunters outside the parks and furred and feathered hunters in the parks.

Many persons, including famous naturalists and big game hunters, received their first training in hunting the cottontail, and if we are to pass on to future generations the wildlife heritage that we have enjoyed, the cottontail is an essential element that needs to be preserved and protected.

PHOTOGRAPH BY FRANK W. CHILOS, JR., BOUNDARY CREEK, YELLOWSTONE NATIONAL PARK, FEBRUAR

Wapiti

WAPITI is the Indian name for the large deer, native ot North America, which the white man commonly calls "elk." In Europe, the animal called elk corresponds to the American moose. Therefore, in order to avoid confusion and to prevent misunderstanding, the National Park Service has deemed it advisable to use the Indian name.

Formerly, wapiti were found over much of North America, especially in the Rocky Mountain region and adjacent parts of southern Canada. However, with the advance of civilization its range has been much circumscribed until, at present, its principal stronghold is in the Yellowstone National Park region. There, under the protection of the National Park Service and the Fish and Wildlife Service, this species has increased and the herds contain many thousands.

The wapiti is comparable in size to the red deer of Scotland. A large male has a total length of 8 feet; tail, about 7 inches; height at shoulder, about 60 inches. The general coloration of the male is as follows: Head and neck dark brown; sides and back brownish-gray, with a large straw colored rump patch; lower legs dark brown like the neck. The male also bears widely branching antlers. The female is somewhat paler and does not bear antlers. This species is polygamous. The young usually number one to a litter, but twins are not uncommon. These young usually are born in June and are spotted at birth.

Wapiti usually have their summer range up in the mountain meadows, but in winter they are forced down by snow into the lowlands, as in the Jackson Hole region south of Yellowstone National Park. On the northern winter range, antelope, bighorn, wapiti, and deer all compete for the forage which is often sadly depleted. The worst of this problem is that, as these animals increase, the carrying capacity of the range is proportionately decreased. This has resulted in the overbrowsing and overgrazing of the winter range of the elk until the bad results of overgrazing have given the range little or no chance to recover. Winter feeding the elks hay has somewhat relieved the situation. On the summer range conditions are somewhat better because the elks scatter over a much larger territory and, as their concentration decreases, there is less overbrowsing and overgrazing of the meadows.

Another difficulty encountered on the northern range at Yellowstone National Park is that while many elks formerly drifted down and wintered in the lowlands outside of the park boundaries, the survivors have learned, through the continued shooting of elks in that vicinity, that it is much safer to remain inside the park boundaries, even though food may be scarce and the snow deep.

The fact must be faced that, at present, there are more elks in Yellowstone National Park than the winter range will support. A reduction of the herd is being made by the National Park Service in order to give the winter range a chance to recover and regain its former carrying capacity.

PHOTOGRAPH, YELLOWSTONE NATIONAL PARK, SEPTEMBER 2

Rocky Mountain Mule Deer

THE ROCKY MOUNTAIN MULE DEER, characterized by its large size, is heavier in build and more robust than the white-tailed deer of the western United States or the black-tailed deer of the Pacific coast. The character which gives this species its name of "mule" deer is its large ears and not the mulelike tail which is short with a black tip. (See illustration.) This mule deer has a distinct whitish rump patch and, unlike the California mule deer, the black of the tail involves only the terminal half and does not extend as a narrow stripe up to the base of the tail. The female of this species is on the average considerably smaller than the male.

Usually the antlers of the mule deer are larger and heavier than those of the white-tailed and the coast black-tailed deer. Large bucks of this species have evenly forked, massive, widespreading antlers. The largest set of antlers of the Rocky Mountain mule deer that I have examined and measured had a spread of 42½ inches, with 9 points on one antler and 12 on the other. This buck weighed 320 pounds when dressed. Female mule deer sometimes are known to bear antlers. Three such antlered does have been seen in the course of my studies.

A large four-point buck that I measured in the flesh on September 24, 1924, near Happy Camp, Modoc County, California, had the following measurements: Length, 70 inches; tail, 8 inches; ear from crown, 9 inches; height at shoulder, 44 inches; spread of antlers, 28 inches; circumference of antlers at base, 6 inches; hoof of hind foot, 3½ inches in length and 2½ inches in width.

The Rocky Mountain mule deer has two distinct coats each year. In summer the coat is tawny to yellowish brown, while in winter it is dark gray. This winter or "blue" coat is acquired about the middle of September.

Once at Yellowstone National Park while I was watching a group of deer, a black bear ambled across the meadow a short distance away. The deer immediately pricked up their ears, snorted in alarm, and watched the bear intently. (See illustration.)

PHOTOGRAPH, YOSEMITE NATIONAL PARK, AUGUST 1,

California Mule Deer

CALIFORNIA MULE DEER occur abundantly in Sequoia, Kings Canyon, and Yosemite National Parks. Under the protection afforded these animals by the National Park Service—no hunting or shooting of deer being allowed in our national parks—they have increased and multiplied there, so that the surplus overflows and provides hunting in the areas surrounding the parks.

This species has a robust body and is considerably larger than the white-tailed deer of the eastern United States and somewhat smaller than the Rocky Mountain mule deer. An average adult buck has a total length of about 57 inches and a black-tipped tail about 6½ inches long. A fair-sized buck stands about 40 inches high at the shoulder and weighs between 150 and 200 pounds. Females are smaller and lighter than males.

Deer have distinct summer and winter coats. In summer the hair is reddish brown; in winter it is a fairly dark gray, commonly referred to as the "blue" coat. (See illustration on page 60.)

The evenly forked, widespreading, massive antlers are typical in all races of mule deer. Normally, these are borne by the males only and are shed each year, usually between January 15 and February 25 at the end of the "rut" or mating season. Each spring new antlers sprout and grow. While growing they are covered with a soft velvet (see illustration), are warm to the touch, and are evidently quite tender because when feeding together at this time of the year the bucks are careful to avoid striking them against those of other bucks or any hard or rough object. It is amusing to watch the care exercised in this regard, in view of the fact that a few months later, when the antlers are fully grown, hardened, and polished, the bucks may take part in fierce combats and use the antlers to defeat and sometimes even to kill each other.

The gait of the mule deer is not so smooth and graceful as that of the white-tailed deer. It is characterized by a bold, bounding action which serves two functions. First, it enables the mule deer to travel rapidly over rough broken rocks, bushes, and boulders which are frequently encountered in the West. Secondly, the high jumps of this bounding gait temporarily give the animal an elevated vantage point from which it can see any pursuing enemy.

The bucks often run separately from the does and fawns during the summer, but in the breeding season each buck keeps jealous watch over his "harem." Normally bucks are not the leaders of mixed bands of deer. Throughout most of the year the real leader is some wise old doe, usually the mother of fawns in the group, that knows the best feeding grounds where forage is plentiful.

PHOTOGRAPH, YOSEMITE NATIONAL PARK, OCTOBER 30, 1

California Mule Deer (CONTINUED)

THE FAWNS, born late in June or early in July, are reddish-brown, spotted at birth with creamy white. Usually there is but one fawn in a litter, but often twins are born. Beginning July 9, 1928, in Yosemite, I watched a pair of twin fawns from the time of their birth, which was actually witnessed, and weighed and measured them each day for the succeeding 10 days. Then they could outrun me, so I was unable to catch them. I found that at birth the fawns weighed about the same as an average human baby and that for the first week of their lives the daily gain was about the same as in a human infant. When 24 hours old a typical female fawn weighed 6¼ pounds and a male fawn 7½ pounds. The "spots" are lost in September when the summer coat is shed.

Most of the food of mule deer is obtained by browsing rather than grazing, although these animals eat considerable quantities of grass at certain times, especially in the early spring. The leaves and young shoots of many shrubs and trees are eaten at all seasons, deer brush, manzanita, and snowbrush being favorites. Acorns are frequently eaten in early winter.

As the colder days of fall approach, the bucks frequently choose a sunny spot in the forest for a bed. There, after pawing out any protruding rock or branches, they curl up and go to sleep for a daily sun bath. During the winter I have found that some bucks often seek a bed of dry leaves under a sheltering rock or tree rather than bed down in the snow, although they will take the snow bed if nothing better is available. In the heat of summer they will choose a cool bed under the shade of some dense pine tree.

The most important natural enemies of the California mule deer are the mountain lion, the mountain coyote, and the human hunter. Both the mountain lion and man seem to exercise a preference for deer in the best physical condition, although there are many humans as well as cougars that take the first available deer. Contrasted to this, it has been my experience that the coyote exercises a selective pruning effect on deer in California in that the majority of deer captured by coyotes are weak, sickly, or diseased individuals, probably because the coyote can more easily capture these. It should be pointed out that the elimination of such diseased deer may benefit the species by preventing contagion of healthy individuals.

Woodticks are probably the most important external parasites of the California mule deer, while lungworms and the nasal botfly infest the lungs and nasal passages of deer. A parasitic eye worm of the genus *Thelisa* has recently been found infesting the deer at Sequoia National Park.

In spite of natural enemies, disease, parasites, and human hunters, the mule deer in California are increasing.

PHOTOGRAPH BY FRANK W. CHILDS, JR., PELICAN CREEK, YELLOWSTONE NATIONAL PARK, SEPTEM

Shiras Moose

The moose is the largest member of the deer family found in North Ameriea. The total length of an average male moose is about 100 inehes; its tail is short, only a little more than 2 inehes in length; height at shoulder, about 72 inehes. Both male and female stand higher at the shoulders than at the rump and both have a general brown coloration. Their muzzles are broad. The males and some females have a charaeteristie growth of skin and hair called the "bell" hanging from the throat. (See illustration.) The antlers of this species are broad and palmated and a good pair has a spread of about 56 inehes, although antlers considerably larger have been reeorded. The females are deeidedly inferior in size and are without antlers.

As with other members of the deer family, the antlers of the moose are grown during the late spring and summer months and are covered with velvet, i. e., skin, while they are growing. As soon as they have reaehed their full growth, this velvet dries up and is rubbed off, leaving large completed bony antlers. The growing and shedding of sueh large antlers each suecessive season appears wasteful; however, this is a eharaeter of the deer family.

When one bull moose hears another crashing through the timber at the mating season he evidently considers it as a challenge and proceeds to battle. These battles may oeeur in the timber, out in the open, or in shallow water. As each bull advances he lowers his head and ears to meet the onward rush of his opponent, who maintains a similar posture. During the early stages of the campaign there is eonsiderable "feneing." The animals rattle their horns together and each seeks to reaeh through to gouge his opponent's ear or eye with the long sharp points of his antlers. In the more furious eampaigns each combatant attempts to shove his opponent baekwards and then to take him off his guard and gore him with his sharp antlers. Oeeasionally, these animals get their broad antlers interlocked and become so weakened by their struggles that they are unable to disengage them. As a result both eombatants may perish. The forelegs and hoofs are also frequently employed in these fights.

The moose is an excellent swimmer and, especially in summer, both the males and females spend a great deal of time wading and swimming about in the quiet ponds in seareh of aquatic vegetation, their main food supply at that season of the year. Another important reason for their taking to the water in summertime is that, by keeping most of their bodies submerged, they are able to escape the attacks of myriads of insect tormentors, sueh as mosquitoes and black gnats. Although in summer moose prefer regions where lakes and streams furnish them with a good food supply of aquatie plants, in the fall they prefer the open aspen and adjaeent forest, and in winter feed largely in willow thickets.

PHOTOGRAPH, HEAD OF SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JUNE 27, 1926. COURTESY OF MUSEUM OF VERTEBRATE

Stone's Caribou

THE CARIBOU is a Stone Age animal because stone carvings, which are among the earliest graphic records of man, show the caribou in its present characteristic form. Caribou live chiefly on the tundra or barren regions of the far North. They are gregarious by nature. In early summer they often occur in small bands of six to a hundred or more, while in late summer or fall they frequently congregate in large herds of 1,000 to 5,000.

Although caribou really are deer and not cattle, the males are usually referred to as "bulls," the females as "cows," and the young as "calves." An average adult male of this species is about the size of a small Jersey cow but has longer legs. The males have wide-spreading antlers which are shed and grown anew each summer. Unlike other species of deer, the females also bear antlers. The males are the first to shed their antlers and they are then at the mercy of the antlered females. The general coloration of both sexes is brown but they have a contrasting whitish neck and rump patch. In color and size, a very young caribou closely resembles the calf of a Jersey cow.

In midsummer caribou often seek high, wind-swept ridges and snow-filled gulches in order to escape the attacks of biting flies and mosquitoes that are abundant in the lowlands. On such trips the bands frequently are led by some old female, probably because she knows where the best green pastures are located and where safety for the weak young caribou may be found.

Caribou have a keen sense of smell but their eyesight is relatively poor. I have found it possible, by lying flat on the ground, to crawl slowly down a hill right into the midst of a band of grazing caribou when the wind was blowing from them to me and they could not get my scent. Under such circumstances it was always a female, usually one with a young "calf," that first detected my presence.

At present the caribou at Mount McKinley National Park are confronted with several dangers, the most important being the possible introduction of disease and the weakening of the native wild caribou through inbreeding with the smaller and weaker domestic reindeer.

PHOTOGRAPH, LAMAR RIVER, YELLOWSTONE NATIONAL PARK, JUNE,

American Pronghorn

The American pronghorn, often called antelope, is a characteristic inhabitant of the open arid plains in the western United States. It is a graceful animal and shows a large degree of curiosity. In Yellowstone National Park I have found that I could sometimes decoy these animals to within camera shot by lying in the grass and kicking my heels up into the air.

The two outstanding characteristics of this species are the short, slightly curved horns and large yellowish-white rump patch. This rump patch is composed of long, white hairs which are controlled by the skin muscles and can be raised at will. In times of excitement these hairs stand stiffly erect like a pert chrysanthemum, and are used by the pronghorn as an alarm signal to warn the members of the band of approaching danger. Its rear position makes it particularly conspicuous in bright sunlight when the frightened animal dashes away across the plains. Both the male and female bear horns. Normally, horns are permanent structures; only antlers are shed and grown anew each year. However the antelope is an exception to this general rule amongst American big game, because its horn sheaths are shed annually.

The pronghorn has a total length of about 50 inches; short tail, about 5 inches long; height, at shoulder, from 34 to 36 inches. An average male weighs about 120 pounds. In color, it is a rich reddish brown and has a darker brown stripe extending across the midline of the neck.

During the fawning season, the male antelope frequently stands sky-lined on the ridges, keeping watch over females and young in the sagebrush plains below.

The antelope's greatest enemy is man. However, coyotes keep them active, and some young fawns undoubtedly are captured by these wild dogs. Golden eagles also have been known to swoop down and attempt to capture fawns when they strayed away from their places of concealment.

Pronghorns appear to be relatively free from disease. Instances of lung infection are known to exist. At Yellowstone National Park an autopsy performed on a doe to ascertain the cause of death revealed both the presence of lungworms and a hemorrhagic condition of the lungs.

In the far West, particularly in northeastern California, northern Nevada, and southeastern Oregon, there has been an increase in the number of these animals during the past several years, partly through the establishment of the Charles Sheldon Antelope Refuge in Nevada. Previously feared to be in danger of extermination, they have in Yellowstone National Park, through the protection afforded them by the National Park Service, increased their numbers to the carrying capacity of the range.

PHOTOGRAPH, LAMAR VALLEY, YELLOWSTONE NATIONAL PARK, SEPTEMBER

American Bison

The American bison and grizzly bear are considered by many persons the outstanding native animals in North America. Certainly few other mammals have played so important a part in the development and early history of the great western plains.

From 1830 to 1860, hundreds of thousands of bison, commonly known as buffaloes, roamed over the great plains west of the Mississippi River and were the main food supply for the Indians and early white settlers in the region. With the building of western railroads and the resultant influx of white men, the slaughter of buffaloes became so great that by the close of the century these animals were reduced to the verge of extinction.

In 1900, when a census was taken of the Yellowstone National Park herd, only 29 bison were counted and it was estimated that not more than 40 were left in the entire park. In 1902, through a congressional appropriation, three bulls were obtained from the Goodnight herd of Texas and 18 cows from Conrad Allard in Montana. From this nucleus of approximately 61 individuals more than 3,000 bison have been produced from 1902 to 1940, inclusive. To prevent overgrazing, nearly 2,000 have been removed from the park in the past 34 years. Of these, 661 were supplied for exhibition and restocking, and about 1,300 were slaughtered for human (mostly relief) consumption.

On September 18, 1929, with heavy white frost covering the stunted sage bushes, I followed an old bull bison across the Lamar Valley, Yellowstone National Park. He had reached the zenith of his prowess and tracks showed that he recently had been dethroned in combat by a younger, more vigorous male. While no longer head of the herd, he trailed along behind the last stragglers still trying to regain his lost leadership. When I approached him he charged furiously and, being alone and on foot, I nearly lost my camera before securing the picture I desired. (See illustration.)

The buffalo is an outstanding example of the animals which have been saved from extermination in the United States through the protection afforded them by the National Park Service and the Bureau of Biological Survey (now the Fish and Wildlife Service) in Yellowstone National Park and other national reservations. It is our sincere aim and hope that the trumpeter swan, grizzly bear, and Rocky Mountain bighorn may likewise be preserved from extinction.

PHOTOGRAPH, MERLIN K. POTTS, ROCKY MOUNTAIN NATIONAL PARK. MAY 24.

Rocky Mountain Bighorn

THE ROCKY MOUNTAIN BIGHORN, commonly called mountain sheep, is the most famous of all the mammals living in Rocky Mountain National Park. This species occurs also in Grand Teton, Yellowstone, and Glacier National Parks in the United States and in several of the Canadian National Parks.

The general coloration of Rocky Mountain bighorn is brownish or grayish brown on the back, yellowish white on the under parts, with a whitish patch on the rump which is very conspicuous. The tail is short and dark. The brownish hairs are darkest on the head, throat, legs, and along a narrow strip down the center of the back. The body is densely covered with coarse hair and on some specimens there has been found a slight undercoat of woolly hairs. The eyes are golden yellow, the horns brown, and the hoofs black.

This large wild sheep is not likely to be confused with any other mammal. The adult rams have a length of from 60 to 70 inches; height at shoulder from 38 to 42 inches; a stocky body usually weighing between 200 and 300 pounds; and massive, circular horns which curve backward about the side of the head. (See illustration). The females, often called "ibex," are shorter and more slender than the rams, weighing only about two-thirds as much, and they possess small slender, slightly curved horns. (See page 72.)

This species formerly was much more numerous than it is today. On account of the excellent quality of its meat, the bighorn was considered by hunters to head the list of wild game. This, together with the fact that the massive horns of the rams were considered by hunters to be an outstanding trophy, resulted in these animals being widely hunted and greatly reduced in numbers throughout their range. However, this general destruction has been offset, at least in part, by the protection afforded them in our national parks, where a fair bighorn population is now to be found, although it is not up to the carrying capacity of the range in all cases.

Generally speaking, the bighorn is now a resident of the higher mountains and in summer is found at or above timber line where these wild sheep seek suitable alpine pastures and where broken cliffs serve as a protection against predatory enemies. In winter they seek to avoid soft deep snow for it not only cuts off their food supply but also renders them more liable to attack by predators. However, prevailing winter winds often sweep bare certain high alpine slopes, thereby leaving forage available, which enables some of the bighorns to winter on the mountain tops. It has been our experience in Rocky Mountain National Park that many bighorns still try to descend in winter to the foothills to find food and escape danger from deep snow.

PHOTOGRAPH, ADOLPH MURIE, MOUNT EVERTS, YELLOWSTONE NATIONAL PARK, JANUARY 2

Rocky Mountain Bighorn (CONTINUED)

BIGHORNS usually are most active in the early morning, and experience with these animals in Glacier National Park indicates their greatest feeding activity occurs before noon, and often by 10 a. m. or thereabouts they retire to the base of some protecting cliff and bed down. On September 1, 1931, at Glacier National Park, I found that a band of bighorns came down regularly during the night or early morning to a mineral spring near a lake. However, by sunup the band was always back up on the mountainside. This flock consisted of six ewes, six lambs, and two young rams. The lambs were well grown but still nursing.

The feeding habits of the bighorns are peculiar in that a relatively small amount of time is spent in grazing and a relatively large proportion of time is spent in chewing their cuds. Usually this latter process is done when the sheep are bedded down, and it has been found that each cud is chewed for about 1 minute. One advantage of this system of feeding is that the animals can gather a large amount of rough herbage in a relatively short time and later during the middle of the day they can thoroughly chew this food at their leisure. How I envy them at my "rush" lunch period!

At Poudre Lake in Rocky Mountain National Park at 2 p. m. on July 6, 1930, I saw a band of 14 Rocky Mountain bighorns and followed them to the upper slopes of Specimen Mountain which is 12,482 feet high. About 4:30 p. m. they resumed feeding on the patches of green turf amid the rock slides. Seeing me, the animals ran rapidly up to the rim and stood on the skyline, but when I quietly withdrew they soon returned to their feeding.

The old rams at certain seasons keep together in a band by themselves and do not run with the females and lambs. At Specimen Mountain in Rocky Mountain National Park one afternoon I counted 28 bighorns—8 lambs of the year and 20 females and yearlings.

One lamb is usually born to a ewe each year, about the first of June, but twins are not infrequent. On Mount Washburn, Yellowstone National Park, on July 5, 1934, a park ranger saw two bighorn lambs, one of which he estimated to be about 2 weeks old and the other slightly older. One of the ewes called to her young, with a bleat similar to that of a domestic sheep but lower in tone.

Numerous instances of hybrids between Rocky Mountain bighorn and domestic sheep have been reported. Actual breeding between bighorn and domestic sheep has been observed. In one instance at least seven hybrid lambs were definitely known to have been born as a result. J. D. Figgins, formerly Director of the Colorado Museum of Natural History, informed me that some of these hybrids grew up, bred, and were fertile. Domestic sheep not only seriously compete with the bighorns for food but the fact that they interbreed with the wild sheep and that the hybrids are fertile indicates that the relationship is sufficiently close so that parasites or disease might be transmitted from one animal to another and may account for the decrease in the number of bighorns. There is also the real danger of weakening the native bighorn stock through its breeding with the inferior domestic sheep.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JULY 27, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZO

Dall Sheep

THE DALL SHEEP is perhaps the outstanding large animal found in Mount McKinley National Park. It is numerous in the Mount McKinley region and during my entire stay there in 1926 there was scarcely a day that I did not count from 50 to 100 of them on the surrounding hillsides within a mile of my camp. In fact, I counted more than 3,000 at different times during that one season.

Dall sheep are white the year around. An average ram stands about 39 inches at the shoulder and weighs about 200 pounds. The ears and tail of this species are short and inconspicuous. The males have relatively slender, widespreading horns (see illustration), while those of the females are short and only slightly curved.

In the McKinley region, mountain sheep winter along the foothills at the north base of the mountains at a relatively low elevation where the snowfall is comparatively light. Here the sheep are able to paw down through the snow to get at the grasses and browse which form their daily food. These grasses mature and cure on the stem and thereby provide an adequate, natural food supply during the winter months.

The white woolly lambs are born in May or the early part of June. Frequently twin lambs are born. Their cradle is a warm pocket in the rocks and is usually protected by surrounding cliffs. As soon as they are able to run about, the lambs congregate in small groups. Once in the Savage River Canyon, in the latter part of May, I found a Dall sheep nursery or "kindergarten" where 10 lambs were romping about together. This "kindergarten" was watched over constantly by one of the mothers. Apparently, the mothers shared this labor because one would watch the lambs a while, then she would go off to feed and another would assume the duty. The favorite game of these lambs appeared to be "follow-the-leader," and each youngster took a turn leading the group up some boulder or cliff. As soon as one circuit was completed, another lamb would serve as leader, choosing a different route.

Although to me this type of play seemed to be rather hazardous, it was probably nothing but the normal, necessary training for these young animals to enable them to escape their enemies and, when they grew up, to maintain their race. Once I watched a wayward lamb venture out on a slanting rock, overhanging a sheer drop of 80 feet. I held my breath, because the daring youngster seemingly was headed for certain destruction. A watchful mother was also taking in the situation, and, quickly bounding over the rocks, butted and pushed her erring offspring back to safety.

PHOTOGRAPH BY DR. FRANK R. OASTLER, GLACIER NATIONAL PA

Rocky Mountain Goat

The Rocky Mountain goat is our outstanding mammalian mountaineer and is found in the mountains of the West from Mount Rainier north to Alaska. In my experience, it is a dweller of the higher peaks where snow is a common feature of the landscape. Although commonly called a goat, this animal is really a large white antelope and is related to the European chamois.

The Rocky Mountain goat is clothed with long, shaggy, creamy-white hair and fine woolly undercoat. In fact, in the northern portion of its range, the wool of this animal formerly was woven into substantial blankets by the Chilkat Indians. The males are distinctly larger than the females, having a total length of about 6½ feet and a height at shoulder of 3½ feet. A large male weighs approximately 300 pounds. Both sexes are armed with rather slender black horns which curve slightly backwards.

The mountain goat is a characteristic inhabitant of Glacier National Park and I found a number of these animals at Sperry Glacier on August 11, 1931. The hostess at the Chalet told me that about July 1, when the Chalet first opened for the season and the higher mountain slopes were deeply covered with snow, there were as many as 30 or 40 goats around the Chalet. She also told me that the goats disturbed the slumber of the visitors by running and jumping on the roof of the Chalet at night.

At Glacier National Park on September 3, 1931, George Wright and I made a 14-mile hike to Cracker Lake where we found by actual count 29 goats. At that season their wool was nearly 3 inches long. We found that the goats came down during the night and early morning hours into the alpine meadows to feed but that they always started back up to the protecting ridges as soon as the sun struck their feeding ground. We watched four animals—two females and two juveniles—that were taking a sun bath near the summit of a steep talus slope at the base of a cliff. First they pawed out a level bed in the loose rock; then, having made a comfortable bed about 36 inches in diameter, the female goat laid down and stretched out on her right side, neck extended in the sun. Dr. Frank R. Oastler was fortunate enough to procure an excellent photograph of a female and her young (see illustration) resting as above described. The old males were more retiring, but I secured a picture of one at a distance of 50 yards. When this male became alarmed and started to run with a clumsy gallop, the female and juvenile also took fright and followed.

Formerly, I had the impression that I could go anywhere a mountain goat could travel, but a few experiences in following this animal soon convinced me that this was not the case.

BIRDS

PHOTOGRAPH BY GEORGE M. WRIGHT, GULL ISLAND, YELLOWSTONE NATIONAL PARK, JUNE 4,

White Pelican

THE WHITE PELICAN is a large grotesque water bird which breeds on the inland salt lakes of the Great Basin in western United States. There is a small colony of white pelicans breeding at Molly Island, Yellowstone National Park.

This bird has a length of about 5 feet, a wing spread of 8 to 9 feet, and a bill about a foot long. Its general coloration is mainly white, but the tips of the wings are contrastingly black.

Frequently the pelican has difficulty rising from the water. In taking off, the bird springs into the air and, for a distance of about 50 feet, both feet are kicked backwards into the water at each stroke of the wings, their toes spread to give a surface of large resistance. When sufficient momentum and altitude has been obtained the feet are drawn up and extended behind the bird. In flight it assumes a rather rigid position with head thrown back, resulting in a crook in the neck.

The pelican's nest usually is a depression made in gravel or sand with a slight foundation of sticks and weeds. Here one to three dull white eggs, about the size of a common goose egg, are laid. As a rule two eggs are laid in each nest. During the nesting season, one adult pelican of each pair stays on the nest to incubate and guard the eggs. Close watching is necessary because gulls are always on hand to pounce upon any unprotected nest and as soon as a brooding pelican is frightened from its nest the gulls rush in to break and eat the eggs. For this reason, the National Park Service has endeavored to prevent unauthorized visitors from landing on the islands in Yellowstone Lake which the pelicans use as nesting sites because a large number of gulls nest nearby, sometimes right in the pelicans' rookery.

Because of their fish-eating habits pelicans have been much persecuted by man. For instance, there is considerable antagonism on the part of fishermen because, they claim, these birds destroy many trout and other game fish. While pelicans do eat many fish, investigation shows that most of the fish taken are the so-called "rough" fish or species that are slow in movement and, for the most part, not game fish. Moreover, it is felt that the pelicans, by destroying these rough fish, automatically assist the trout by providing a more abundant food supply for them—food which would otherwise be eaten by the rough fish. Therefore, by their destruction of the rough fish the pelicans in a large measure compensate for the trout and other game fish which they eat.

COPYRIGHTED PHOTOGRAPH BY DR. FRANK R. OASTLER, RED ROCK LAKES NATIONAL WILDLIFE REFUGE

Trumpeter Swan

THE TRUMPETER SWAN is the largest species of native waterfowl now living in North America. It is of magnificent proportions, having a length of more than 5 feet and a wing spread of from 8 to 10 feet. Specimens weighing 32 pounds have been reported. The adult bird of this species has a pure white body, although its head and neck sometimes have a brownish stain, caused by the bird's habit of sticking its head and long neck down under water to feed. The bill and patch of feathers between the eyes and base of bill are black, as are also the legs.

This bird formerly bred from Fort Yukon, Alaska, and northern Canada south through British Columbia and Alberta to Montana and Wyoming, and eastward to Nebraska and Iowa. Each fall flocks are believed to have migrated through the Mississippi Valley to the Gulf of Mexico. With the coming of civilization and the settlement of its habitat by white men, the trumpeter swan, being a large conspicuous bird, was so greatly reduced in numbers by shooting that by 1929 only a few breeding pairs were known to remain in North America. In the whole United States less than a dozen pair were known to breed and most of these were located in or adjacent to Yellowstone National Park. The National Park Service, fearing that the species would soon become extinct, as had the great auk, passenger pigeon, heath hen, and other outstanding native North American birds, took steps to preserve it. For this reason, the Service in 1930 began a study to ascertain the location, numbers, and condition of the remaining birds of this species breeding in Yellowstone National Park and adjacent territory. Persons who lived the year round where a pair of swans had nested each year for the previous five seasons stated that during this entire time the swans had not succeeded in raising a single offspring to reach maturity.

George Wright and I decided to be on hand at the beginning of the nesting season and to keep a close watch during the critical incubation period and succeeding weeks, while the young were small, in order to find out as nearly as possible just what happened to the eggs and young of the swans. On June 9, 1930, when we reached the lake we found a pair of trumpeter swans present. A search with the binoculars revealed one of the birds, which later proved to be the female, sitting on top of a small mound of dead tules that apparently had been gathered together and heaped up by the swans to form a nest about the size of a haycock. (See illustration.)

Trumpeter Swan (CONTINUED)

For the first 24 hours of their lives, the cygnets stayed on the water or on their nest, but at the end of that period, choosing a small islet in the lake, the youngsters scrambled ashore. On land, in short grass, they made good progress, traveling about 6 feet in 20 seconds, and then squatted down apparently exhausted from the effort. Occasionally the cygnets stood erect extending their necks vertically, but most of the time their heads were held forward and their bodies prone as they slid gracefully through the grass, propelled by alternate strokes of their large and wobbly legs. Upon reaching a bit of open ground covered with a dense growth of short, green salt grass, the cygnets stretched out their necks and crouched down to rest in the warm sunshine. The soft, fine natal down with which the day-old cygnets were covered reminded me of a new, unused powder puff. (See illustration.)

The eye of the little cygnet in this illustration was such a rich dark brown that it almost appeared to be black. Its bill and feet were a pale flesh color, while the tip of the bill and toenails had a slight olive-yellow cast. In the bright sunshine, one of the cygnets appeared to be gray, and later we found some of them are gray instead of white when they are hatched.

Subsequent observations of this family showed that while the cygnets were young and in the downy stage the mother usually took the precaution to lead them ashore on a small islet well out into the lake rather than to chance their landing along the main margin of the lake where they might be captured by coyotes or other prowling land animals. As the youngsters grew older, they developed an initiative of their own and frequently led their parents about. Whenever danger was close at hand the mother took her youngsters in tow and led them back to safety in the thick tules but if the danger was more remote the father usually went out to meet the enemy, honking a warning note to his family as he went. Upon hearing this signal, the young cygnets would scatter and hide separately in the thickets of dead tules, their rasping, squeaky call notes serving to keep the members of the family in touch with each other.

The National Park Service expects the full cooperation of all park visitors in protecting the trumpeter swans, especially during the nesting season. It is imperative that fishermen, photographers, and all persons not having actual business near nesting swans should remain away from lakes where the swans are known to nest. A relatively slight disturbance may cause the mother to leave the nest long enough for the eggs to become chilled and thus fail to hatch.

PHOTOGRAPH, LAMAR RIVER, YELLOWSTONE NATIONAL PARK, JUNE 11, 1930.

PHOTOGRAPH, LAMAR RIVER, YELLOWSTONE NATIONAL PARK, JUNE 23, 19

Trumpeter Swan (CONTINUED)

THE ADULT SWANS, like many parents, had considerable difficulty in keeping track of their young. When any danger from a nearby shore threatened, the mother swan usually led the family to safety while the father covered and brought up the rear. When danger from the air threatened, as in the case of ravens, hawks, or eagles, the parent swans gathered their young together into a compact flock which they kept in close formation between them. (See illustration.)

In one instance I was able to witness an enemy's attack. From the rear, it was warded off by the male spreading his wings and thereby covering and protecting the young, while the mother, in like manner, met the attack from the front. This teamwork of the parents proved to be effective and successful in warding off daytime attacks. As the cygnets grew larger, however, they became more independent and strayed farther from the protecting wings of their parents. Then it was more difficult for the parents to protect their offspring.

When the young cygnets were about the size of a mallard duck, some of them mysteriously began to disappear one by one. Therefore, on July 17, 1931, I moved to Trumpeter Lake and remained watching throughout the night. I found that the little family fed steadily until 8:30 o'clock in the evening and then went ashore. They remained there until something frightened them back into the water, but at 9 o'clock that evening, keeping in a small, compact flock in the tules, they went to roost for the night. Although I kept a continuous watch of their roosting site in the tules, I found the next morning that, between 9 o'clock the previous evening and 5 o'clock that morning, one of the cygnets had disappeared. Later observations showed that the pure white cygnets were usually the first ones to disappear. It is my belief that they were the first to be captured and killed because their white coloring was more readily seen in the dim light. It was noted that as long as the mother swan hovered her young at night they were safe, but as soon as they left her protecting wings and the home roost trouble began.

The old birds had considerable difficulty in getting their young trained to fly before the "freeze-up" in the fall. One observer reported that one day before a big storm he noted the old swans trying, without success, to induce a cygnet to fly.

Even though the young swans were able to fly in the fall, we found that danger still stalked them. Although they were protected by international, Federal, and State laws, investigation showed that some of the trumpeter swans were being shot. In the Red Rock Lakes area, which lies outside of Yellowstone National Park, we received reports of a hunter who shot and killed 16 young trumpeter swans in one hunting season. He claimed that they were China geese. So a campaign of education was instituted among sportsmen, and the National Park Service is glad to report that it now has the whole-hearted support of these men in pointing out the need for preserving this rare species. Finally, through the joint efforts of the late George M. Wright and of "Ding" Darling, who was then Chief of the Biological Survey, the critical area where the trumpeter swans congregate outside the park was purchased and established as a Federal migratory waterfowl refuge so that we now feel that the trumpeter swans are properly protected and slowly regaining their former numbers.

PHOTOGRAPH BY RICHARD M. BOND, LAVA BEDS NATIONAL MONUMENT, NOVEMBER 2,

Ducks and Geese

Multitudes of migrating waterfowl are not usually associated with extensive lava formations, such as one encounters at Lava Beds National Monument in northeastern California. The fact that this monument is bordered on the north by the Tule Lake National Wildlife Refuge explains why the photograph on the opposite page came to be taken in that region.

Early in November 1937, when this photograph was taken, there were literally thousands of geese, such as honkers (Canada), speckle-bellies (white-fronted), and snow, together with many pintail, widgeon, and other species of ducks, which had bred in the far northwestern parts of North America, using Tule Lake as a "city of refuge." They had stopped there on their flight to their wintering grounds in the South. Likewise, in lesser numbers, they stop over on the spring migration to their breeding grounds in the North.

As a reliable means of counting and recording the number of waterfowl present in a given area at one time, I have found it satisfactory to use a speed photograph taken when ducks and geese are suddenly frightened into taking flight. Then, by making an enlargement from the negative thus obtained, it is possible, by ruling the picture off into half-inch squares, to count as many as 5,000 ducks and geese on a single negative. By using this method the errors of estimation are eliminated. It has been my experience that when such comparable photographs are taken at the same locality, at corresponding seasons, over a period of years, they form the most reliable and accurate census method yet devised for recording the numbers of migrating waterfowl which pass through the United States each spring and fall.

The migratory wildfowl in North America do not belong to the people of the United States alone, because many of them breed in Canada and winter in Mexico. A treaty between the United States, Canada, and Mexico provides for international protection of migratory wildfowl. Our Government, through its Fish and Wildlife Service, is doing its share by establishing and maintaining scores of Federal migratory wildfowl refuges, of which Tule Lake National Wildlife Refuge is a good example.

PHOTOGRAPH, GIANT FOREST, SEQUOIA NATIONAL PARK. AUGUST

Sierra Grouse

THE FEMALE SIERRA GROUSE is about one-third smaller than the cock, which averages 21½ inches in length, and has a general brownish color with a light gray terminal tip of the tail which is characteristic of both sexes. A close view (see illustration) shows that the female's plumage has a complex pattern caused by light gray patches on the margins and tips of the feathers. This "broken" type of color pattern tends to conceal the bird amid the broken patches of light and shadow of its forest home. I have repeatedly been within 15 or 20 feet of this grouse and still unable, because of this concealing coloration, to see it until it moved.

At Cahoon Meadow, Sequoia National Park, on July 2, 1933, soon after sunup, I watched a female Sierra grouse lead her large brood of eight downy chicks out of a white fir thicket and feed along the margin of the meadow. These chicks were difficult to see in the dense grass except when they jumped up off the ground after small insects, chiefly gnats and flies, as was demonstrated by catching one of the youngsters. Upon hearing her captured chick's cry of distress, the mother grouse fluffed out her feathers, spread her wings and tail like an irate setting hen, and flew directly at me. After the first attack, the mother tried to lure me away from the chicks by crawling off as though wounded. Upon hearing their mother's alarm, the chicks scattered in every direction and hid in the grass.

By continued observation, I found that this family drank water only once a day but that they imbibed 35 times within a period of 5 minutes.

Sierra grouse are very fond of grasshoppers, which they stalk in a deliberate fashion. One grouse that I watched in the act of stalking a grasshopper saw the insect several feet distant. Immediately the bird stretched out its neck, kept its head and bill close to the ground, and moved slowly and quietly in a straight line until about 18 inches from the insect. Here there was a brief pause. Then, making a sudden rush, the bird grasped its prey in his bill before the grasshopper had a chance to even jump off the ground.

Outside of the national parks this species has been so reduced by shooting that, in November 1936, a request was made by the California Division of Fish and Game to the National Park Service for two settings of eggs to be used for experimental hatching purposes. They hoped that the species might, through artificial propagation, be restored on certain areas where it had become almost extinct.

Alaska Ptarmigan

THE ALASKA WILLOW PTARMIGAN is an Arctic grouse about the size of the ruffed grouse of the eastern United States (length, 15 inches). It has one marked character, namely, the color changes to pure white, except for the black tail feathers, in the wintertime. It is believed that since these birds live in the far North where the ground is covered with snow during many months of the year, their winter coat of white feathers makes them much less noticeable against this snowy background. This concealing coloration is thought by some to be of survival value to the species. Another winter adaptation of the species is the feathering extending down the legs to the base of the toes. This may be an added protection from the cold in winter.

Ordinarily we think of the ladies as being the ones to spend the most time changing their dresses, but in the ptarmigan family it is quite the reverse. In the spring the male assumes his nuptial or wedding dress. First, the feathers on his head and neck change to a rich chestnut color; then, about the time the ptarmigans set up housekeeping, these reddish brown feathers begin to come in on his back. (See illustration.) In fact, he spends most of the summer changing his clothes and then wears his complete summer plumage for only a few weeks. When it is fall he begins to change back into his pure white garb. On the other hand, Mrs. Ptarmigan wastes no time changing her white winter plumage. She puts on her new house dress and goes right to work.

In June 1926, at Mount McKinley National Park, I watched the courtship of a pair of ptarmigans for many hours. The male reminded me of a diminutive turkey gobbler as he strutted about his mate with his head erect, neck extended, and tail spread and sticking out stiffly behind him. The vivid red comb over each eye was carried erect. At intervals he mounted a rock or tussock on the tundra and gave his coarse cackle, which reminded me of someone running a fingernail over the teeth of a stiff comb.

On May 21, 1926, a ptarmigan nest was found on the ground under a dense clump of dwarf birch. This nest was merely a depression wallowed out in the soft reddish moss covering the ground at this spot. While the mother ptarmigan was on the nest the cock seemed to realize that his conspicuous coloration might lead robber gulls or other enemies to the nest. Consequently, he retired to a small thicket about 50 feet from the nest and occupied a roosting place on the ground, where he was well screened and hidden from view. Here he would lie in wait to repel any attacks of thieving gulls or other invaders and to protect his mate.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, MAY 25, 1926.
COURTESY OF MUSEUM OF VERTEBRATE ZOOLOGY.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JUNE 6, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZOO

Alaska Ptarmigan (CONTINUED)

THE BUFFY-BROWN FEMALE ALASKA PTARMIGAN wastes no time strutting about and crowing. She attends strictly to business, and she has serious business to attend to because there are many enemies that like to eat ptarmigan eggs or ptarmigan chicks, as well as adults. One of the outstanding enemies of the willow ptarmigan in the McKinley region is the short-billed gull. These gulls work in gangs, usually three birds together, flying about over the tundra scouting for ptarmigan nests. When a nest is located, one of the gulls swoops down at the brooding female and tries to make her shift over a little on the nest and expose an egg. The second gull then swoops in and endeavors to grab the egg. If it fails, the third gull follows in quick succession.

One hen ptarmigan I observed (see illustration) gave a peculiar call for help as soon as these gulls appeared. Upon hearing this call, the cock ptarmigan, who was in hiding near the nest, burst forth like a rocket shot from a gun. He flew directly at the robber gulls, knocking them down with the impact of his body.

Not only are their eggs in danger but newly hatched chicks are much relished by magpies. On June 24, 1926, I found a family of four young and two adult magpies searching systematically through the willows for ptarmigan chicks. As soon as the magpies located a pair of adult ptarmigans they retired stealthily and hid in some willows nearby. Here they kept perfectly quiet until the ptarmigan chicks, thinking the danger was past, again began to run about. Then the magpies swooped in, captured the chicks before they could hide, and carried them off to feed their own young. One cock ptarmigan was able to put one old magpie to flight. But in the above instance there were six, and in another case nine magpies working together against two adult ptarmigans. The odds were overwhelming and, by July 10, I found that this ptarmigan family had lost all except one or two of its chicks. Ptarmigans have many enemies but their correspondingly large families (from six to twelve) compensate in the continuation of their race.

Ptarmigan chicks, like young quail, start running about soon after they are hatched. They are exceedingly active and often lead their parents in their search for food. I have found that small insects comprise more than 95 percent of the young ptarmigan's food.

PHOTOGRAPH, ASH MOUNTAIN, SEQUOIA NATIONAL PARK, FEBRUARY 27,

Valley Quail

Unlike its relative, the mountain quail, the valley quail is an inhabitant of the lower foothills and valleys. This bird is of medium size, being 10 inches in length. The adult male has a conspicuous black "comma" shaped plume. The top of his head is dark brown; throat black, encircled by a white band; breast brownish gray, with a rich chestnut patch in the middle of the belly; back chiefly brown; tail grayish. The adult female is brownish gray and somewhat smaller than her mate. She has the scaled belly and streaked flanks of the male, but lacks the chestnut patch on the belly and the black throat patch of her mate. She also has a smaller plume. (See illustration.) The plump form, together with the curved black plume, which is about 1 inch long, and the scaled feathers along the belly, distinguishes this quail from any other bird.

For many years, several pairs of valley quails have lived at park headquarters at Ash Mountain in Sequoia National Park. Here, they seem to feel and appreciate the protection given them. By the last week of April these quail are usually all paired off and about to nest.

On March 10, 1935, I had an excellent opportunity to test the speed at which a quail flies. While driving along the highway just below the park boundary, a female valley quail flushed from a bush by the side of the road, about 50 feet ahead of me, and flew at full speed directly down the highway. I stepped on the gas and found that when she was doing her best she was unable to draw away from the car when the speedometer registered 36 miles an hour.

On October 16, 1936, I photographed six different California gray foxes that had become accustomed to the presence of human beings and congregated at night about the cabins of Ash Mountain to pick up any stray food scraps that were thrown out. A family of California coons consisting of a female and four young, three striped skunks, and one small spotted skunk also came about the buildings nightly. Seeking to determine the effect of this unusual concentration of the so-called "predatory" animals on the quails, I made a careful investigation and found that the quails not only maintained their former numbers but had increased slightly. Repeatedly I counted 16 adult quails, while two seasons previously there had been only 10 or 12.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JUNE 18, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZOO

Semipalmated Plover

THE SEMIPALMATED PLOVER is one of the common shore birds in the far North and is a regular breeder in Mount McKinley National Park. It is about 7 inches long and in general appearance is much like the small killdeer plover. The killdeer has two black bands across its breast, whereas the semipalmated plover has only one. This trim little bird is white on its under parts and brownish gray above.

During the first week of June two of their nests were located on a gravel bar where rocks were extremely numerous. In fact, the nests were merely slight depressions amid the bare rocks. Like many other shore birds, the male performs most of the household duties, including incubation of the eggs.

On June 18, 1926, I found a brood of newly hatched plover chicks and procured the photograph on the opposite page. Upon seeing us, the parent plovers quickly gave their warning call, whereupon the chicks, with one exception, flattened out on the gravel, their heads and necks extended, and remained motionless. The lone chick that would not heed its parents' command to hide kept running about picking up small insects and other bits of food at the water's edge. Plover chicks have unusually large and well-developed feet which makes it possible for them to run freely over soft mud without bogging down. The wayward offspring was a distinct source of anxiety to its parents. When it insisted on running about, in spite of repeated warnings, the father flew directly at it and roughly knocked it off its feet. But the chick still refused to obey. Finally, the father pecked it severely on the head, whereupon it stretched out its neck and at last lay still and motionless, but not for long.

This undue independence on the part of the chick proved its undoing a few days later when a jaeger or "robber gull" came flying up the river in search of food. The father plover gave his warning call and the other three chicks all flattened out and remained motionless, their gray backs blending so closely with the gravel that a person could scarcely see them, even when about to step on them. But the wayward chick, evidently believing that it was not necessary to heed its father, continued running about. The "robber gull" made just one swoop, grabbed the wayward chick in his bill, and swallowed it.

PHOTOGRAPH, MOUNT MC KINLEY NATIONAL PARK, MAY 29, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZO

Surfbird

THE SURFBIRD winters along the coast of South America and migrates to the Mount McKinley region in the interior of Alaska for the breeding season. In migration, it is found on rocky islets along the Pacific coast of North and South America where it lives on marine life gathered amid the spray of the breaking waves.

It is a heavy-set ploverlike shore bird about the size of a common killdeer plover (10 inches long). In the field, it may be recognized by its white breast which is covered with numerous bold, black triangular markings. The white bar across each wing and white patch at the base of the tail are both conspicuous when the bird takes wing.

Although the surfbird has been known to science for 150 years, the first nest and eggs of this species was discovered by George Wright and me in Mount McKinley National Park in May 1926. The Indians had a legend that this bird nested far in the interior, high up on the mountains above timber line. Scientists said this was a case of mistaken identity. The nest we found was 1,000 feet above timber line, just as the Indians said. It was merely a slight depression on an open rocky ridge beside a well-used mountain sheep trail, and was located when we almost stepped on the brooding bird. While we were watching the nest, a female sheep came along the trail and at the last moment, just as she was about to step on the nest, the incubating surfbird flew directly up into the face of the astonished animal. The sudden noise and flash of white of the bird's wings and tail frightened the sheep so that she jumped back quickly. Repeated experiments showed that this was the bird's regular way of saving its nest and eggs from being stepped on.

During the 18 hours we watched this nest, the male alone incubated the eggs. This "maternal" male was extremely careful to keep them warm and dry. Whenever he returned to the nest he always approached cautiously, being careful not to step on the eggs. Then, turning the eggs over with his bill (see illustration), he squatted down, fluffed out his breast feathers, and slid gently forward, covering them.

PHOTOGRAPH, MOUNT MCKINLEY NATIONAL PARK, JULY 13, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZOO

Hudsonian Curlew

The Hudsonian curlew is one of our largest shore birds, having a length of from 16½ to 18 inches. Its brownish color, long curved bill, and white stripe on the sides of its head above and below the eyes, are all good field marks. Curlews are noisy birds, particularly when their home territory or nesting grounds are invaded during the breeding season.

The Hudsonian curlew breeds on the open wet tundra in Alaska and northern Canada. At Mount McKinley National Park we found that longtailed jaegers or robber gulls frequently nested close by, often within a few feet of the curlews. There seemed to be some sort of an understanding between the two species whereby the curlews served as watchmen and the jaegers as policemen, both species benefiting thereby. Whenever an intruder invaded their common nesting ground the constantly watching curlews, with the advantage of long legs and necks, were quick to see him and sound a long raucous warning cry. The jaegers, thus aroused, would then take up the battle and drive the wandering caribou or grizzly bear away from the vicinity of the curlews' nest as well as their own nest. In this way, the eggs of both species which were laid out on the open tundra were protected from trampling.

On July 13, 1926, near Mount McKinley, a female curlew, with chicks about the size of a quail, tried to decoy us away from her family through the common ruse of spreading her wings and tail and then crawling along through the weeds as though crippled. Meanwhile, the young curlews eluded us by hiding in clumps of fireweed.

Through binoculars we watched the parent curlews as they fed and were surprised to find that, instead of foraging for aquatic life in the water, they stalked, captured, and ate large bumblebees and other insects that they deftly picked out of blossoms of flowering plants. The curlews would hold the larger flies and bumblebees in the tips of their bills and, while thus holding them, would strike their bills against the rocky ground thereby breaking up and killing the insects so they could be easily and painlessly swallowed. One curlew, however, swallowed bumblebees without breaking them up and the insects could be seen as lumps going down in its throat.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JUNE 22, 1926. COURTESY OF MUSEUM OF VERTEBRATE ZOOLO

Wandering Tattler

THE WANDERING TATTLER is a rare wading bird that breeds along glacial streams on the eastern flank of the Alaska Range in the interior of Alaska. Outside the breeding season, these birds inhabit the rocky headlands and islets along the Pacific coast of North and South America. During the breeding season they have been found nesting regularly in Mount McKinley National Park where they inhabit the open gravel bars near the heads of mountain streams.

The tattler is a medium-sized bird about 11 inches long. Its black slender bill is about as long as the bird's head. The adult is plain slate gray above, with heavy gray broken bars on the throat and under parts.

These birds are quiet and secretive during the first part of the breeding season and as long as the eggs are in the nest. This is particularly true when they leave or approach the nest, which is well hidden among the rocks. As soon as the young are hatched, however, the parent birds become exceedingly bold and noisy. They then perch on the top of a willow or other vantage point where they keep a close lookout for danger. Upon the approach of intruders they utter their strident warning calls, fly out to meet them and, if possible, divert their attention from the chicks. After they have succeeded in decoying the intruders away they again become quiet and silently sneak back to their offspring. The male (see illustration) shares family duties with the female.

A few hours after the chicks are hatched their gray downy coats become dry and these hardy youngsters leave the nest and begin to seek their own food which consists of tiny insects.

The young tattlers, as a rule, instantly heed their parents' warning cry and crouch flatly on the gravel, where their gray backs blend perfectly with the rocks. They remain motionless as long as the danger signal is given. When the chicks become older they run about more independently, and instead of hiding by squatting out in the open, amid the bare rocks, they hide in the grass and flowering plants lining the banks of streams. If closely pursued, these older chicks will swim boldly across a stream with a fairly swift current to escape from their pursuers. Fortunately the nesting grounds of this and other rare species lie within a national park, where they are protected by the National Park Service.

American Hawk Owl

The American hawk owl is a dweller of the spruce woods rather than the open, treeless plains. Its medium size (total length, 15 inches), long tail and slender body give this bird a decided hawklike appearance. Its rapid wingbeats, direct flight, and habit of perching in the open on the top of some dead tree correspond with the actions of the common butcher bird or shrike, which it resembles in many ways.

In the far North many species of owls have to hunt by day as well as by night. This is particularly true of the American hawk owl. On June 8, 1926, a companion and I found a hawk owlet sitting quietly on the forest floor. Apparently it had fallen from its nest. We took it back to camp, where we raised it on mice which were abundant and easy to trap. Experiments proved that this young owl could see just as well during the day as at night. Whenever we made a slight noise, similar to a mouse scratching, the owlet was all attention (see illustration), but if a violent noise was made close to the bird it shook its head, seemingly in distress.

The call note of this owl is a long drawn-out screech with a sharply accentuated high-pitched ending, "all-l-l-right!" Whenever we gave a good imitation of this "liaison" call, we found that any hawk owl in the neighborhood would respond and it frequently came directly to the spot where we gave the call. By following the owls, it was discovered that this distinctive call is the method used by members of an owl family to keep track of each other when hunting in the forest.

The number of hawk owls in a given area seemingly is closely related to the abundance of mice in the same area. In June 1926, at Savage River, Mount McKinley National Park, I found these owls so numerous that 39 were counted in 2 days. Field mice and varying hares were also abundant at that time in the spruce woods inhabited by the owls. Six years later I again visited this identical area and, although I hunted all summer for these birds, I did not find even one. During my second visit I found that both field mice and varying hares also were absent from this area. It is believed that the absence of these rodents, which are the owl's chief food supply, was the real cause for the lack of owls.

PHOTOGRAPH, SAVAGE RIVER, MOUNT MCKINLEY NATIONAL PARK, JUNE 13, 1926.
COURTESY OF MUSEUM OF VERTEBRATE ZOOLOGY

PHOTOGRAPH, MCKINLEY BAR, MOUNT MCKINLEY NATIONAL PARK, AUGUST 14

Alaska Jay

The Alaska jay is found throughout much of the timbered section of Alaska and is particularly at home in the spruce forests of the interior. This bird is sometimes called the whiskey jack, moose bird, or camp robber.

It is a plain jay with soft fluffy feathers. The adult bird has a white forehead with a dark band behind the eye and throat. (See illustration.) The young bird has an evenly dark, almost black, head and neck, and in general is much darker than its parents. One of the best field characters of the adult is the uniform gray coloration. This species lacks the crest of the blue jay of the eastern United States and the blue-fronted jay on the Pacific coast. It has a length of about 12 inches.

One of the outstanding characteristics of this bird is its bold nature. No sooner is the camper's fire lighted than the Alaska jay is on hand to share whatever food may be available. Food that is left on the camper's table, bacon left in the frying pan, and other camp supplies, if unattended, are never safe from this bird. Even the cabin door has to be tightly closed against its inquisitive bill.

This bird breeds very early in the spring or even in the latter part of winter. In the McKinley region the Alaska jays commence their spring song about March 20, while the snow is still several feet deep. This singing marks the beginning of their nesting activities. Their nests are artfully concealed in the dense tops of spruce trees, where they are well protected from rigorous snowstorms by the overhanging branches. They are compactly made of sticks and frequently lined with hair from caribou or mountain sheep. On May 20, 1926, I found a pair of these jays in a spruce grove on the Savage River. Their brood of three bob-tailed young was just out of the nest and barely able to fly.

At Mount McKinley, George Wright and I watched and enjoyed a contest between an Alaska jay and a northern red squirrel over a piece of discarded cheese. Every time the jay alighted in the top of the spruce tree near our camp the squirrel selected the correct tree, ran up it, and drove the jay away. After the squirrel had succeeded in driving off the jay, we watched it remove the piece of cheese that it had cached in the crotch of a tree and carry it to a nearby rotten log where it was carefully hidden again. Evidently this squirrel did not trust the Alaska jay.

Long-Crested Jay

THE LONG-CRESTED JAY is a large blue jay about 12 inches in length. This jay has a distinct high black crest on the top of its head, a conspicuous broad white streak extends a short distance above each eye, and its forehead is streaked with bluish white. The wings and tail are a deep blue, finely barred with black, while the rump and under parts are a light blue. This jay is a common and conspicuous resident on both rims of the Grand Canyon and is one bird which, because of its brilliant coloring and noisy nature, thrusts itself upon the visitor's attention.

There is considerable argument regarding the food of this bird. Investigation has shown that insect life constitutes about one-third of the food and vegetation about two-thirds. There is no denying the fact that these jays do eat eggs and nestlings of other birds when they get a chance. Acorns form a staple article of their diet and in harvesting them, the birds have to compete with chipmunks and ground squirrels. The jays usually do not store a large number of acorns in any one place but hide them singly by burying them an inch or two deep in soft loamy soil and covering the cache with fallen leaves to hide it from the prying eyes of the chipmunks and ground squirrels. In burying the acorns, the jays unintentionally serve as natural foresters, since many of the acorns are never recovered but sprout and grow, thus replenishing the forest.

The jays are the sentries of the forest and are quick to give a warning alarm signal whenever danger threatens or a strange animal approaches. In areas outside the national parks and monuments deer hunters, particularly, are frequently exasperated by the jays giving a warning cry and spoiling the chance of bagging some wise old buck.

The nest of the long-crested jay is a bulky affair but it is usually well concealed, often in a dense small coniferous tree or in brush. It is composed of twigs and dry grasses and often lined with rootlets or fine grass. Sometimes it is cemented with mud in the same manner that the robin cements its nest.

On October 30, 1930, I found long-crested jays fairly numerous on the South Rim of the Grand Canyon near El Tovar. They were very watchful and would cock their heads on one side peering intently for any scrap of food that might be dropped or discarded by the visitor. While long-crested jays may be considered as scavengers and pirates, as well as watchmen, the mountains and canyons would be dull indeed without their flash of blue as they flit from tree to tree.

PHOTOGRAPH, SOUTH RIM, GRAND CANYON NATIONAL PARK, OCTOBER 30, 1930.

PHOTOGRAPH, SILLIMAN CREEK, SEQUOIA NATIONAL PARK, JUNE 24,

Dipper

THE DIPPER, frequently called "water ouzel," is one of the outstanding inhabitants of our mountain streams. It was made famous by John Muir in his *Mountains of California*, and is a bird dear to the heart of every mountaineer. To its many friends the dipper recalls memories of trout streams, waterfalls, and foaming cascades. Many of the birds that are found in the forests clothing the western flank of the Sierra Nevada are summer visitants only, but the dipper, while not numerous, is an exceedingly important and characteristic dweller along the mountain streams the year around. Its range in the mountains of western North America extends from Yukon in Alaska to Guatemala in Central America.

This bird is a plump, uniformly slate-gray colored water sprite. Its length, from bill to end of tail, is about 7½ inches; wing, about 3½ inches; tail, short and usually carried upward at a rakish angle. The close and compact body feathers of this bird permit it to dive under water and even walk on the bottom of mountain streams in search of insect food. Recent observations have substantiated the fact that, at times, the dipper uses its wings to aid it in its progress under water. Hence this bird may be said to "fly" through the water as well as through the air. The outstanding character of this bird is its exquisite song, poured forth in winter as well as summer.

On June 23, 1933, I spent considerable time watching a pair of dippers that had their nest high up in the forest on the Marble Fork of the Kaweah River in Sequoia National Park. This nest, located in a dark cavity behind a waterfall and composed chiefly of moss, was entirely roofed over, the birds gaining their entrance through the side. This compact cozy home was well protected from invasion by the waterfall, and the spray kept the moss fresh and green.

Aquatic insects, gleaned from under stones and pebbles on the bottom and along the margin of the stream, constituted the chief food of this family. I endeavored to photograph one of the parents while it was feeding along the edge of the stream, with the waterfall in the background. (See illustration.) Since the light was poor and the bird was very dark, a slow exposure was necessary and the flying spray is shown in the foreground as a series of white streaks.

Certain fishermen condemn the dipper, claiming that it destroys prospective fish which they themselves want to catch. It is true that at times dippers have been seen feeding on trout eggs, but it is my belief that such destruction is not excessive. Ornithologists generally agree that this bird should be fully protected, especially since its population is naturally low.

PHOTOGRAPH, GIANT FOREST, SEQUOIA NATIONAL PARK, AUGUST 9

Black-Headed Grosbeak

THE BLACK-HEADED GROSBEAK is generally conceded to be one of the best singers amongst the birds in the West. An excellent field character of the male is his outstanding rollicking song. The female is much quieter. The three or four young grosbeaks which fill the nest are always hungry and require a prodigious amount of food.

The outstanding color characters of the adult male are the black head; black, white, and brown-streaked back; the broad white patch in each wing; and the cinnamon brown under parts, becoming lemon yellow on the belly. In the female and the young, the black of the adult male is represented largely by brown; however, they have the two characteristic white patches on the wings, as well as the broad streak above and below the eye. (See illustration.) The male, which is slightly larger than the female, has a length of about 7 inches; wing about 4 inches; and tail about 3 inches. When observed at close quarters, a certain identification is the heavy, short, but powerful bill which gives the bird its name and is very useful in the bird's gathering and eating certain seeds.

The nest is a loose platform of sticks and fine rootlets, and is so flimsily made that I have, at times, been able to see the eggs through the bottom. In spite of the fact that the grosbeak usually places its nest in brush or in the lower branches of a tree near the ground, I have rarely known one to be dislodged through the movement of the branches by violent winds. The eggs, however, sometimes roll out of their shallow nest.

In both Yosemite and Sequoia National Parks the grosbeaks are quick to make friends with campers. Some become so tame that they will alight on a table or sit at arm's length on a chair and share a meal with the camper, even though the person may be a total stranger. These birds are especially fond of fruit, such as ripe peaches, apricots, and cherries. In one instance, at Yosemite, I had a friend who left a piece of watermelon standing on the table during a short absence. When he came back he found two grosbeaks sitting on the rind which was about all that was left.

This songster is a summer visitant in the West and spends its winters in Central America. Its arrival late in the spring, announced by its clear song, is always a red-letter day for the bird lover. Its departure in the fall is much less noticeable. It is here one day and gone the next.

REPTILES

PHOTOGRAPH, EMIGRANT RANGER STATION, DEATH VALLEY NATIONAL MONUMENT, SEPTEMBER

Leopard Lizard

Reptiles constitute a large portion of the animal life native to Death Valley National Monument, California. Many kinds of lizards and snakes have been found in this area and there are doubtless other species yet to be discovered.

The combined total length of head, body, and tail of the leopard lizard is frequently in excess of 12 inches. Its head is not noticeably larger around than its body. The upper portion of this lizard is grayish brown with white or creamy lines across its back; between each pair of white lines is one or more round dark brown spots. The long tapering tail is marked like the back, but less regularly.

In many lizards the male assumes a special color during the breeding season, but in this species we find a noteworthy exception. The female becomes brilliantly colored with deep salmon red which extends along the sides of the body often involving the sides of the tail, whereas the male retains his plain coloration during the breeding season.

The range of the leopard lizard extends across the desert plains from Texas to California, and north into southern Idaho. In Death Valley this species is most numerous at elevations of from 2,000 to 5,000 feet in the broad sandy desert washes near the bases of mountains. I have never found them numerous on the floor of Death Valley, which is below sea level, though specimens have been recorded from Furnace Creek and Saratoga Springs.

Dr. C. Hart Merriam reports finding this lizard eating the blossoms and leaves of plants, while other observers ascribe to it a more carnivorous diet of insects, such as grasshoppers, robberflies, and beetles. Although an innocent looking reptile, this lizard is at times a ferocious cannibal, eating other smaller lizards. It is harmless as far as human beings are concerned.

Although it does not have the ability of making as sudden a departure as does the gridiron-tailed lizard, which starts off as though shot from a gun, the leopard lizard has greater endurance. In short, he is a "miler" instead of a hundred-yard dash runner.

PHOTOGRAPH BY E. LOWELL SUMNER, JOSHUA TREE NATIONAL MONUMENT, SEPTEMBER 2

Desert Tortoise

THE DESERT TORTOISE is extremely well adapted to living in arid regions and can be found in the desert areas of southern Nevada, southeastern California, and the adjoining portions of Arizona. Van Denburgh, an authority on western reptiles, records a specimen from the Cottonwood Mountains in Joshua Tree National Monument, Riverside County, Calif.

This animal has a broad flat shell with a deep serrate margin. The individual shown in the photograph on the opposite page had a shell measuring about 7 inches in length and was believed to be about two-thirds grown. The carapace, or top of the shell, is made up of squarish plates bordered with fine concentric lines and its general coloration is brown; the lower portion usually is yellowish or horn color. This tortoise has stout legs. The front legs are armed with 5 claws adapted to digging and the hind ones are short and stumpy. The tail is short.

These reptiles are vegetarians and live on the succulent parts of such plants as they can reach. It is said that they eat the fleshy parts of various species of cacti and no doubt some of their water supply is gained from this source because they live in places where it is impossible for them to get a drink for long periods. The desert tortoises are said to come out of their burrows in considerable numbers after a thunderstorm and probably it is at such times that they obtain most of their water supply for the season.

These reptiles are slow and deliberate in their actions. Dr. Charles Camp reports that one of them, in traveling at its usual gait, made 20 feet in 1 minute, by the watch, and he suggests that 4 or 5 miles a day would be about their limit.

When one desert tortoise meets another, it nods its head rapidly up and down as if to say "how-do-you-do." If the two happen to be males, a lively fight is apt to ensue. The males are said to court their mates by biting them gently around the edges of their shell.

When E. Lowell Sumner took the photograph reproduced on the opposite page, he found the dried shell of another tortoise nearby. He reports that tooth marks on the empty shell indicated the animal had been eaten by a coyote. Frank Stephens, who spent many years in the desert, told me that frequently he found tooth marks on the shells of living tortoises indicating that coyotes had endeavored to bite into them.

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